JOURNAL

OF THE

ARNOLD ARBORETUM

HARVARD UNIVERSITY

ALFRED REHDER
EDITOR

JOSEPH H. FAULL AND CLARENCE E. KOBUSKI
ASSOCIATE EDITORS

VOLUME XX

JAMAICA PLAIN, MASS.
1939

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Arnold Arboretum of Harvard University
KRAUS REPRINT CORPORATION
New York
1968

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DATES OF ISSUE

No. 1 (pp. 1–138, pl. 226–231) issued January 26, 1939.
No. 2 (pp. 139–280, 2 pl.) issued April 28, 1939.
No. 3 (pp. 281–402) issued July 19, 1939.
No. 4 (pp. 403–479) issued October 25, 1939.

Printed in U.S.A.

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JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XX JANUARY, 1939 NUMBER 1

A SYNOPSIS OF THE NORTH AMERICAN SPECIES OF SORBUS

GEORGE NEVILLE JONES

With plates 226 and 227

SORBUS, THE MOUNTAIN-ASH, is a genus of vascular plants belonging to the subfamily Pomoideae of the Rosaceae. In all, including CORMUS, ARIA and MICROMELES, there are approximately 80 species (Rehder, Man. Cult. Trees Shrubs, 1927) distributed throughout the northern hemisphere. Many are of economic importance as ornamental shrubs. They are attractive especially when in bloom, with large compound terminal corymbs of fragrant white flowers early in the season, and showy, usually red, fruits in the autumn and winter. A great deal of confusion exists as to the identity, specific limits, nomenclature, and geographical distribution of the North American species. It is the purpose in this paper to attempt a taxonomic revision in the form of the following short synopsis.

The subfamily Pomoideae Focke consists of a group of genera of ligneous plants with the ovary inferior and the fruit a pome. Many of the genera are very closely related to one another, and a number of natural hybrids are known to occur between them. Apparently they had a common origin, and it seems probable that all originated by genetic change within the basic set of 17 chromosomes, and that various degrees of chromosome differentiation now exist in the different genera (Sax, K., Jour. Arnold Arb. 1931). Hybrids are known to occur between *Aronia* and *Sorbus, Amelanchier* and *Sorbus,* and between *Pyrus* and *Sorbus;* a hybrid between *Malus* and *Sorbus* has been reported (*Bollwilleria malifolia* Zabel, Mitt. Deutsch. Dendr. Ges. **16:** 76. 1907, nom. nud.) but no plants or specimens of such a hybrid seem to exist. There is no record of hybridism between *Malus* and *Pyrus,* although

these genera are morphologically very similar and have been cultivated side by side for thousands of years with the consequent ample opportunity for such hybrids to occur.

In view of the close relationship between these genera it is often a difficult matter to outline a satisfactory taxonomic arrangement. Each generic group, though sharing the well known characteristic of some other members of the Rosaceae in being rather deficient in those fundamental conservative morphological characters that are commonly accepted by botanists as of primary importance, is nevertheless very distinct in appearance and habit from its near relatives. *Sorbus* forms an extremely natural genus, and in view of the marked differences in the flowers, inflorescences, fruits, and foliage, it is difficult indeed to see why it should be included with the pears and apples. However, suggestion has been made recently that the Pomoideae be reduced to one genus, on account of this obvious close relationship, but both the demands of a practical taxonomy, as well as a sound basis in physiology and morphology, indicate that the various recognizable natural units in this subfamily are probably better maintained as separate genetic and generic entities, as they have been in the main for between one and two centuries. This conclusion has been accepted by the most eminent students of this group since the time of Linnaeus.

All the North American species of *Sorbus* belong to Section AUCUPARIA (Med.) K. Koch, of which most of the members are Asiatic. They are characterized by their odd-pinnate leaves, their 2–5 carpels which are not completely connate, and by the small, usually numerous, chiefly red, berry-like fruits, which lack or have only very few stone-cells.

In this paper 11 species and one variety of *Sorbus* are recognized, described and attributed to North America and Greenland. The important structural features used in the characterization of the species are the size and number of the flowers; the size, color, shape, and the number of the fruits; the size and shape of the inflorescence; the relative length of stamens and petals; the number and length of the styles; and the shape, size, and color of the seeds. The seeds of most species are distinctive and specifically recognizable, but their characteristics are difficult to describe in words. Although there is a certain amount of variation in the degree of flattening depending upon the number that mature in one pome, the size, shape, color, and dimensions of the mature seeds are apparently constant for a given species. This number varies from one to five in the material examined. The leaves furnish very good specific characters. The number, shape, size, texture, indument, and serration of the leaflets are definite. The glossiness or dullness of the upper

surface of the leaflets is a fundamental and fixed character of considerable diagnostic value, very useful in the identification of living plants. Although the lustre is to a great extent lost in herbarium specimens, the practised eye can detect its presence on specimens of those species which have it, and thus this character is of some value in studying dried material as well. Usually, the species with glaucescent fruits have dull leaflets, and conversely, those with glossy leaflets have lustrous scarlet pomes. There are a few exceptions to this rule, for example, *S. sambucifolia* has glossy leaflets, but glaucous fruits. However, as is remarked elsewhere, this is scarcely a North American type. Other characters used in differentiating species are the habit of the plant, whether arborescent or merely frutescent, and the presence, absence, and kind of pubescence on the pedicels, peduncles, rachises, and leaf-buds. The value of a taxonomic character increases with its constancy, and a character such as pubescence may have in certain groups a considerable, and perhaps unsuspected phyletic value. Differences in geographical distribution are of course not treated as taxonomic characters, but the species herein described are found to occupy definite and natural ranges and life-zones. Most of the North American "species" as treated in the past have exhibited discontinuous distribution and phytogeographical anomalies, suggesting to the competent phytogeographer the probability of more than one specific unit being involved in certain of these aggregates.

Intermediate between *Sorbus* and the closely related genus *Aronia,* and apparently representing intergeneric hybrids, are occasional specimens collected in the region between Newfoundland and Massachusetts. Similar hybrids have been known in European gardens for about 150 years. The leaves of these plants are pinnate, pinnatifid, or lobed, or merely serrate, the inflorescence is of the Aronia type, and the fruits are black, purple, or red. According to Schneider, and to Rehder, these plants belong to the hybrid genus × *Sorbaronia* Schneid. Four such intergeneric hybrids between feral North American mountain-ashes and chokeberries are known. In this paper they are discussed or mentioned under *S. americana, S. aucuparia,* and *S. decora.* A single hybrid between *Sorbus* and *Amelanchier* is known from Idaho and Oregon. It has been described by Rehder as × *Amelasorbus,* and is discussed in this paper under its Sorbus-parent, *S. scopulina.*

One or more species of *Sorbus* occur in nearly every part of the North American continent north of Mexico except the arctic regions, the area between long. 95° and 102°, and the southeastern part of the United States. No species occurs south of latitude 32° N. Only one mountain-ash, *S. decora* var. *groenlandica,* is known to be indigenous to Greenland.

The area from Newfoundland to Minnesota and southward to Michigan and North Carolina is occupied exclusively by the two native species, *S. americana* and *S. decora,* and the naturalized *S. aucuparia.* The remaining eight species are confined to the western half of the continent. *Sorbus scopulina* is the most widespread and abundant species in western North America, extending from British Columbia to New Mexico, and from South Dakota to eastern Washington, and eastern Oregon. *Sorbus dumosa* is a local, rather poorly known and much misunderstood species confined to Arizona and New Mexico. In the mountainous areas adjacent to the Pacific Coast there are three species, *S. californica, S. cascadensis,* and *S. occidentalis.* Extending from southern Alaska, across British Columbia, and southward to Glacier National Park, is *S. sitchensis. Sorbus alaskana* is a newly described species from Alaska. The Asiatic *S. sambucifolia* is scarcely a North American type, and is present in the western hemisphere, so far as is now known, on only four islands of the Aleutian chain. Thus it is apparent that each species has a natural and well-defined geographical area.

The principal recent works containing taxonomic studies of the genus *Sorbus* are by T. Hedlund in Kongl. Svenska Vetensk.-Akad. Handl., 1901; C. Schneider, Ill. Handb. Laubholzk. vol. 2, 1907; and A. Rehder, Man. Cultivated Trees Shrubs, 1927. There are treatments of the species of eastern Asia by E. Koehne in volume 1 of Sargent, Plantae Wilsŏn. (1913), and by A. Rehder in the second volume (1916) of the same work.

In the enumeration of specimens on the following pages, the name of the herbarium from which the specimen came is indicated by the following parenthetical letters: (A) Arnold Arboretum, (CA) California Academy of Sciences, (Can) National Museum of Canada, (G) Gray Herbarium, (NE) New England Botanical Club, (NY) New York Botanical Garden, (UC) University of California, and (US) United States National Herbarium. Acknowledgment is here made to the curators of these herbaria for their courtesies. Special thanks are due Dr. Theodor Just of the University of Notre Dame for photographs of certain type-specimens, and to Professor Alfred Rehder for innumerable useful suggestions and criticisms.

KEY TO THE NORTH AMERICAN SPECIES OF SORBUS

Fruits 4–11 mm. in diameter at maturity; flowers 5–10 mm. broad; calyx 2–4 mm. long at anthesis.

Winter-buds densely whitish-villous; rachises, pedicels, and calyces usually copiously whitish pilose-pubescent at flowering time.

Tree, naturalized in North America; leaflets 11–15; inflorescence 75–100-flowered; fruit 9–11 mm. in diameter ....1. *S. aucuparia*

Shrub, native in the mountains of Arizona and New Mexico; leaflets 9–11; inflorescence 40–60-flowered; fruit 6–8 mm. in diameter... .....2. *S. dumosa*

Winter-buds glabrous or pilose, the trichomes whitish or ferrugineous. Leaflets 11–17; stipules caducous.

Winter buds glabrous (or the inner scales sometimes sparsely ciliate toward the tips); leaflets narrowly oblong-lanceolate to lanceolate, acuminate, finely serrate; fruits 4–6 mm. in diameter; flowers 4–6 mm. broad; tree (or shrub) eastern North America... .....3. *S. americana*

Winter-buds more or less pilose and ciliate; fruits 7–10 mm. in diameter at maturity; flowers 7–10 mm. broad.

Lateral leaflets lanceolate or oblong-lanceolate, acuminate to acute, usually three to five times as long as broad, finely serrate almost to the base, glossy above (when living); seeds oblong, 3.5–4 mm. long; western American shrubs.

Inflorescence normally flat-topped, 9–15 cm. broad, 80–200-flowered; species of the Rocky Mountain region..... .....4. *S. scopulina*

Inflorescence rounded, 3–6 cm. broad, less than 40-flowered; species of northwestern Alaska .....5. *S. alaskana*

Lateral leaflets oval or oblong, abruptly acute, seldom more than three times as long as broad, serrate to the middle or below, not glossy; seeds lanceoloid or fusiform, 4–5 mm. long; northeastern America and southern Greenland .....6. *S. decora*

Leaflets 7–11; stipules usually more or less persistent; shrubs, western America.

Leaflets serrate from apex to middle or below; styles 1–2 mm. long at anthesis.

Winter-buds greenish-brown, glutinous, glossy, glabrous or sparsely pilose; leaflets glossy above (when living); pedicels glabrous or sparsely pilose with short whitish trichomes.

Pedicels sparsely pilose; mature leaflets normally 5–7 cm. long, 2–3 cm. wide; winter-buds 7–15 mm. long, ciliate or sparsely pilose with whitish trichomes; petals 5–6 mm. long; British Columbia to northern California .....7. *S. cascadensis*

Pedicels glabrous; mature leaflets normally 2–4 cm. long, 1–2 cm. wide; winter-buds smaller (3–8 mm. long), glabrous, or the inner scales sparsely rufous-ciliate; petals 3–4 mm. long; California .....8. *S. californica*

Winter-buds dull, the reddish scales dorsally pilose with ferrugineous trichomes as well as marginally ciliate; pedicels ferrugineous-pilose at flowering time; leaflets dull; southeastern Alaska to northwestern Montana and northern Idaho. .....9. *S. sitchensis*

Leaflets entire except near the apex (rarely with a few teeth near the middle), oblong, obtuse; pedicels, petioles, and rachises finely rufous-pubescent; styles 3 mm. long at anthesis; Cascade and Olympic mountains .....10. *S. occidentalis*

Fruits few, ellipsoid, glaucescent, 1–1.5 cm. in diameter at maturity; flowers 10–15 mm. broad; calyx 5–6 mm. long at anthesis; leaflets 7–9, lanceolate to ovate-lanceolate, acuminate, broadest at the base; shrub 1–2 m. tall; Aleutian Islands .....11. *S. sambucifolia*

1. **Sorbus aucuparia** L. Sp. Pl. 477. 1753; Hedlund, Svensk. Vet.-Akad. Handl. **35:** 46. 1901; Schneid. Ill. Handb. Laubholzk. **1:** 672, *f. 371, c-e,* 1906; Britt. & Schafer, N. Am. Trees 428. *f. 374,* 1908; Mathews, Field Book Am. Trees Shrubs 202, *f. opp. p. 202* (as *P. sitchensis*). 1915; Rehder in Bailey, Stand. Cyclop. Hort. **3:** 3195, *f. 3649.* 1917; Bailey, Man. Cult. Pl. 380. 1924; Wiegand & Eames, Fl. Cayuga Basin 246. 1926; Sudworth, Check List 133. 1927; Rehder, Man. Cult. Trees Shrubs 379. 1927; Rosendahl & Butters, Trees Shrubs Minn. 196, *f.* 1928; Schaffner, Field Man. Fl. Ohio 307. 1928; Rydberg, Fl. Prairies Plains 438. 1932; Marie-Victorin, Fl. Laurent. 319, *f. 92.* 1935; Jones, Univ. Washington Publ. Biol. **5:** 180. 1936.

Pyrus Aucuparia Gaertn. Fruct. Semin. Plant. **2:** 45. 1791; Ehrh. Beitr. Naturk. **6:** 94. 1791; Robins. & Fernald in Gray, Manual (ed. 7) 459. 1908; Henry, Fl. S. Brit. Col. 183. 1915; Mathews, Field Book Am. Trees Shrubs 202. 1915.

Aucuparia silvestris Medicus, Geschichte Bot. 86. 1793.

Sorbus subvestita Greene, Pittonia **4:** 131. 1900.

A small tree 6–10 m. tall, with stout, spreading branches; bark grayish, smooth; winter-buds conical, 5–10 mm. long, usually copiously whitish-villous, the pubescence rarely somewhat fulvous; young branchlets more or less pubescent, usually densely so, with grayish or whitish hairs, becoming glabrous in age; leaflets 11–15, oblong, acute, 3–5 cm. long, 1–1.8 cm. wide, somewhat asymmetrical at the base, dull green on the upper surface and more or less pilose when young, pale beneath and usually permanently whitish pubescent; margins coarsely serrate almost to the base, (or in some races to above the middle), the teeth ovate, abruptly mucronate, usually 35–40 on each leaflet, 4–5 per cm.; petioles and rachises whitish-tomentose, at least at flowering time, glandular at the bases of the leaflets; inflorescence 10–18 cm. broad, 75–100-flowered; pedicels and peduncles densely whitish-pubescent (at least in anthesis); flowers 8–9 mm. in diameter; calyx pubescent, the sepals triangular; petals orbicular, sparsely pubescent on the upper surface near the rounded base, 4 mm. long; stamens about as long as the petals; styles

3–4, 1.5–2 mm. long at anthesis, shorter than the stamens; ovary pubescent on top; fruit 9–11 mm. in diameter, scarlet, (glaucescent in herbarium specimens), ripening in August; seeds oval, flattened, light brown, 4 mm. long, 2.5 mm. wide.

TYPE LOCALITY: European.

RANGE: native of Europe; frequently planted for ornament, and becoming naturalized in many places in North America. It has been well established for over half a century from Labrador to Pennsylvania, westward to North Dakota, Washington and southwestern British Columbia.

LABRADOR: Rigolet, July 20, 1921, *Wetmore* (Can). QUEBEC: La Trappe, *Louis-Marie 60* (G). PRINCE EDWARD ISLAND: Brackley Point, *Fernald, Long & St. John 7577* (G, A, Can), *8303* (A, US, NY, Can); Charlottetown, *Fernald & St. John 7576* (A, US, Can). NOVA SCOTIA: Halifax, *Jack 3672* (G, A); Truro, *Jack 622, 631, 3534* (A); Pictou, *Jack 3286* (A). MAINE: Orono, August 22, 1897, *Fernald* (G), *Ricker 404* (US); York, *Bicknell 4986* (NY); Rockland, *Long 966* (NE); Hampden, *Fernald & Long 13758* (NE); Sidney, *Fernald & Long 13757* (NE); Topsham, August 29, 1912, *Furbish* (NE). VERMONT: Brattleboro, May 28, 1912, *Wheeler* (NE). MASSACHUSETTS: Belvidere, *Harris 551* (NE); Indian Ridge, *Pease 1945* (NE); Sherborn, *Loomis 23* (G); Manchester, *Chamberlain* in 1899 (NY); Lexington, April 4, 1917, *Faxon* (A); Swampscott, July 15, 1895, *E. T. & S. A. Harper* (A); Pelham, May 25, 1880, *Minott* (US). CONNECTICUT: Berlin, *Marius Brandegee* (UC). RHODE ISLAND: Wickford, June 17, 1908, *Williams* (G, NE). NEW YORK: Oswego, May 27, 1887, *Coville* (US); Utica, *Haberer 2309* (G). PENNSYLVANIA: Selinsgrove, *Moldenke 2369* (NY). DISTRICT OF COLUMBIA: Washington, June 12, 1892, *Sudworth* (US). ONTARIO: Crystal Beach, June 6, 1926, *Davis* (US); Kingston, September 8, 1900, *Fowler* (US); Snelgrove, *White 5* (G); Hamilton, *Macoun 7841* (Can). MICHIGAN: Marl Lake, September 19, 1915, *Chandler* (US); Williamston, *Yuncker 124* (US). WISCONSIN: Madison, August 24, 1893, *Rock* (US), *Humphrey 89* (US), *Jensen 518* (US). MINNESOTA: St. Louis Co., *Sandberg* in 1890 (isotype of *S. subvestita* Greene, UC); Fort Snelling, September 6, 1891, *Mearns* (G, US); Minneapolis, May 24, 1891, *Burglehaus* (US); Moore Lake, September 5, 1926, *Rydberg* (NY). IOWA: Claremont, *Pammel 46* (US, NY). ILLINOIS: Evanston, *Price* (US); Napeville, May 25, 1898, *Umbach* (US); Jacksonville, May 1886, *Milligan* (US). INDIANA: South Bend, October 1, 1933, *Lyon* (NY, US, A); Laporte, *Deam 9595*

(NY), *17988* (A); Clear Lake, *Deam 26407* (A); Springville, *Deam 7992* (A); Wanatah, October 21, 1924, *Orahood* (NY). MANITOBA: Dropmore, July 1918 and August 1918, *Skinner* (A); Lake Winnipegosis, June 27, 1881, *Macoun* (US, Can). NORTH DAKOTA: Leeds, October 2, 1913, *Lunnell* (US). SOUTH DAKOTA: Brookings, May 25, 1891, *Williams* (US). NEBRASKA: Lincoln, June 10, 1889, *Williams* (US). IDAHO: Hailey, *Woods & Tidestrom 2806* (US). WASHINGTON: Bingen, *Suksdorf 10452* (A); Sequim, May 1915, *Grant* (NY). BRITISH COLUMBIA: Victoria, *Mrs. E. S. Kelley* (CA), *Macoun 79785* (NY, Can). ALASKA: Wrangell, *Coville & Kearney 425* (US), *Eastwood 1010* (A).

Sorbus aucuparia has been a cause of much misunderstanding of the North American species of mountain-ash because specimens of that distinctive European species frequently have been mistaken for the native American *S. decora,* or for intermediates between that species and *S. americana.* It was also the basis for Greene's *S. subvestita.* Likewise, the record of *S. decora* as far west as Manitoba rests on misidentified specimens of *S. aucuparia,* the seeds of which are frequently carried by birds to localities surprisingly remote from human habitations. Complexity is added by the possible fact that *S. aucuparia* L. is a "collective species." Certainly Linnaeus' description of the leaves as "utrinque glabris" does not describe very accurately most of the specimens of the plants that are currently passing as *S. aucuparia.* However, the analysis of the European tree is scarcely within the province of the present study; the problem remains for European botanists to work out. Sterile specimens of *S. aucuparia* often may be identified by the peculiar thickened bases of the lower secondary veins on the back of the leaflet. These appear to be somewhat decurrent along the midvein. Sometimes this condition is not evident at first glance on account of the dense pubescence. Rarely are the leaflets glabrous beneath. The upper surface, usually described as 'pubescent,' in most instances quickly becomes glabrous as in the native species.

Several horticultural varieties of this well known species have been described from European material and many of them are cultivated in American gardens. These are briefly characterized in Rehder's Manual of Cultivated Trees & Shrubs. Hybrids between *S. aucuparia* and *S. americana* are sometimes cultivated. These are known by the name *S. splendida* Hedl. The only example that I have seen of what may be a natural hybrid between *S. aucuparia* and a native species is a collection that appears to represent *S. aucuparia* × *S. decora.* A fruiting specimen (*Macoun 21714*) collected August 11, 1900 near Opeongo Lake, Algon-

quin Park, Ontario, seems to be intermediate in many respects between the two species. The fruits, as well as the pubescence of the buds and the underside of the leaflets, resemble those of the first species, while the shape, serration, and venation of the leaflets are more like those of *S. decora.* The later time of flowering of *S. decora,* and its montane habitat, no doubt prevent frequent crossings of this species with *S. aucuparia.** Sometimes specimens of *S. aucuparia* are confused with *S. decora,* but the densely pubescent buds of the former, as well as the pubescence of the pedicels and the lower leaf surface, and its larger fruits are fairly reliable differentiating characters. In addition, the shape and serration of the leaflets, and the size and shape of the seeds are distinctive. Even on specimens lacking fruits, flowers, or leaves, the densely-whitish pubescent winter buds will usually serve to identify *S. aucuparia* immediately.

There are two natural intergeneric hybrids with different species of *Aronia* reported from eastern North America. These are: *S. aucuparia* × *Aronia arbutifolia* (L.f.) Elliot = *Sorbaronia hybrida* (Moench) Schneid. with the lower surface of the leaflets densely grayish pubescent, and the upper surface lacking any black glands along the midvein, represented by the following specimen: Truro, N. S., *Jack 3267* (US); the other is: *S. aucuparia* × *Aronia melanocarpa* (Michx.) Britt. = *Sorbaronia fallax* Schneid. with the lower surface of the leaves sparingly pilose to glabrous, and the upper surface often with a few black glands along the midvein toward the base of the leaf. The following Gray Herbarium specimens from Massachusetts apparently represent this hybrid: Andover, *Pease 727, 1058, 3146;* East Holliston, July 1909, and May 13, 1910, *Loomis;* Ipswich, May 26, 1908, *Alcott;* also Bangor, Maine, June 9, 1905, *Knight.*

The binomial *Pyrus aucuparia* was published by both Gaertner and Ehrhart in 1791, but if we accept the dates on the prefaces of their two works to decide the question of priority, Gaertner's name is sixteen days earlier, because his preface is dated April 6, while the date on Ehrhart's is April 22. In his list of synonyms, however, Ehrhart cited Ehrh. Plantag. 20, which refers to an earlier work, namely "Verzeichniss der Bäume und Sträuche, welche sich auf der Königl. Plantage zu Herrenhausen bei Hannover befinden." This was published anonymously by Ehrhart in 1787, and consists of a bare list of names.†

It will be noted that, contrary to custom, the specific name of this species is decapitalized. This is done because it appears that Linnaeus

*See Dobzhansky, Genetics and the Origin of Species, 1937. Chapter 8, on isolating mechanisms.

†For a note on this obscure publication see p. 137.

was using the word in an adjectival sense rather than as a noun based on the generic name *Aucuparia* of Rivinus. This is indicated by the fact that he used a small initial.

2. **Sorbus dumosa** Greene, Pittonia **4:** 129. 1900; Hedlund, Svenska Vet.-Akad. Handl. **35:** 138. 1901; Rehder, Man. Cult. Trees Shrubs 378. 1927.

A shrub 2–3 m. tall, with slender, clustered stems; bark reddish; winter-buds densely whitish villous; young twigs densely whitish pubescent; lenticels few, small, inconspicuous, narrowly oval; leaves small, 6–15 cm. long; leaflets 9–11, rarely 13, thin, 2–4 cm. long, 1–1.5 cm. wide, oblong-lanceolate to oval, evenly serrate from the apex almost to the base, the teeth sharp, pointing forward, somewhat gland-tipped; apex sharply acute, the base rounded or cuneate, more or less oblique; upper surface dark green, somewhat glossy, glabrous; lower surface pale green, finely reticulate, glabrous except sometimes a few pilose trichomes along the midvein; petioles and rachises copiously pilose-pubescent or puberulent; inflorescence small, narrow, compact, round-topped, 3–7 cm. broad, 40–60-flowered; pedicels and peduncles densely villous with whitish hairs; calyx densely pubescent, 3 mm. long, the sepals broadly triangular, sharply acute, non-glandular, 1.5 mm. long, more or less ciliolate on the margins; petals about as long as the stamens, oval, cuneate at the base, 3–4 mm. long; styles 4, 2–2.5 mm. long, shorter than the stamens; anthers 1 mm. long; top of the ovary pubescent; fruit red, glossy, ellipsoid to subglobose, 6–8 mm. in diameter; seeds lanceoloid, light brown, 3–3.5 mm. long, 1.5–2 mm. wide.

TYPE LOCALITY: San Francisco Mountains, Arizona. Collected by Greene in 1889.

RANGE: A rather local subalpine species of Arizona and New Mexico.

ARIZONA: Mt. Lemmon, *Shreve 5301* (A, G); Chiricahua Mts., July 1927, *Kusche* (A); Greenland Point, *M. E. Jones 6056f* (US); Baker Butte, *Coville 1048* (US); Elden, September 30, 1910, *Percival Lowell* (A); North River, Grand Canyon Nat. Park, *U. S. Park Service no. 2000* (US); Sabina Canyon, August 4, 1906, *Holmes* (US); Mt. Thomas, *Goldman 2473* (US); White Mts., *Coville 2010* (US), *Goodding 1202* (US, NY), *Peebles & Smith 12516* (US); Kendrick Peak, June 22, 1911, *Percival Lowell* (A), *Purpus 8003* (A, US, UC), *Leiberg 5657* (US), *Goldman 2108* (US); San Francisco Mts., July 7, 1891, *MacDougal 330* (A, US), *Leiberg 5713* (US), *D. E. Palmer* in 1869 (US); Santa Catalina Mts., *Lemmon 183* (UC), *J. A. Harris C16448* (NY), *Livingston & Thornber* in 1906 (NY), *Peebles & Harrison*

2262 (US). NEW MEXICO: Pecos River National Forest, *Standley 4446* (NY, US); Manzano Mts., *V. Bailey 1426* (US); Zuni Mts., *Goldman 1591, 1602* (US); Tunicha Mts., *Standley 7733* (US, NY).

This is a relatively little known and rather obscure species of limited distribution in the mountains of Arizona and New Mexico. It is not closely similar to any other species, but evidently belongs to the *americana-scopulina* group, as is shown by the whitish pubescence and the acute leaflets. Geographically, and probably phylogenetically, it comes closest to *S. scopulina* Greene, but it differs considerably from that species, as is indicated by an examination of a photograph of the holotype, several topotypes, and a fairly good series of other specimens, in being a more slender shrub with fewer and smaller leaflets, a smaller, fewer-flowered, round-topped inflorescence, and a characteristic dense, whitish pilose pubescence or puberulence of the winter-buds, rachises, and pedicels. There seems to be a tendency for the stipules to be persistent.

3. **Sorbus americana** Marsh. Arbust. Am. 145. 1785; Willd. Enum. Pl. **1:** 520. 1809; Schneider, Ill. Handb. Laubholzk. **1:** 677, *f. 371, h-i, 372, g.* 1906; Hough, Handb. Trees N. U. S. Canada 239, *f. 277–279.* 1907; Britt. & Schafer, N. Am. Trees 427, *f. 373.* 1908; Britt. in Britt. & Brown, Ill. Fl. N. States (ed. 2) **2:** 287, *f. 2318.* 1913; Mathews, Field Book Am. Trees Shrubs 201, *f. opp. p. 202.* 1915; Rehder in Bailey, Stand. Cyclop. Hort. 3195, *f. 3648.* 1917; Sargent, Man. Trees N. Am. (ed. 2) 390, *f. 347.* 1922; Bailey, Man. Cult. Pl. 380, 1924; Pease, Vasc. Pl. Coos Co., N. H., 266. 1924; House, N. Y. State Mus. Bull. **254:** 408. 1924; Wiegand & Eames, Fl. Cayuga Lake Basin 246. 1926; Sudworth, Check List 133. 1927; Rehder, Man. Cult. Trees Shrubs 377. 1927; Rosendahl & Butters, Trees Shrubs Minn. 194, *f.* 1928; Miller & Tehon, Div. Nat. Hist. Surv. Illinois Bull. **18:** 202, *pl. 65.* 1929; Rydberg, Fl. Prairies Plains 438, 1932; Small, Man. SE. Fl. 632, *f.* 1933; Coker & Totten, Trees SE. States, 190, *f.* 1934; Marie-Victorin, Fl. Laurent. 319, *f. 92.* 1935.

Sorbus Aucuparia var. α Michx. Fl. Bor. Am. **1:** 290. 1803.

Sorbus micrantha Dum.-Cours. Bot. Cult. (ed. 2) **5:** 464. 1811.

Sorbus microcarpa Pursh, Fl. Amer. Sept. **1:** 341. 1814; Roemer, Syn. Mon. 138. 1847; Hedlund, Svenska Vet.-Akad. Handl. **35:** 41, *f. 7g.* 1901.

Sorbus aucuparia sensu Bigelow, Flora Boston. 119. 1814.

Pyrus microcarpa DC. Prodr. **2:** 636. 1825; Spreng. Syst. **2:** 511. 1825.

Pyrus americana DC. β *microcarpa* Torrey & Gray, Fl. N. Am. **1:** 472. 1843; Nutt. N. Am. Sylva **2:** 25, 27. 1853.

Sorbus americana Marsh. var. *microcarpa* Wenzig, Linnaea **38**: 73. 1874; Rehder in Bailey, Stand. Cyclop. Hort. 3194. 1917.

Aucuparia americana Nieuwl. Am. Midl. Nat. **4**: 175. 1915.

Pyrus americana sensu Watson & Coulter in Gray, Man. (ed. 6) 164. 1889; Sargent, Silva N. Am. **4**: 79, *pl. clxxi, clxxii.* 1892; Chapman, Fl. SE. U. S. (ed. 3) 141. 1897; Dame & Brooks, Handb. Trees New Engl. 112, *pl. lxii.* 1902; Robins. & Fernald, in Gray, Man. (ed. 7). 459. 1908; Mathews, Field Book Am. Trees Shrubs 201, *f. opp. p. 202.* 1915; St. John, Bot. Expl. Gulf St. Lawrence 91, 1922. Non DC., 1825.

A small tree (or shrub) 4–10 m. tall, the trunk with a maximum diameter of 20–30 cm; branches slender, ascending or spreading; bark nearly smooth, gray, with some small irregular scales; winter-buds conical, glabrous or nearly so, 1–2 cm. long, glutinous; young branchlets glabrous or sparingly pilose, reddish brown, with numerous elongate lenticels; leaflets 11–17, lanceolate to narrowly oblong-lanceolate, acuminate, 5–9 cm. long, 1–2.5 cm. wide, 3½–5 times as long as wide, the base cuneate or rounded, somewhat asymmetrical; margins sharply and finely serrate nearly to the base with lanceolate, acuminate, incurved teeth, or sometimes slightly double-serrate; upper surface bright green and glabrous; lower surface paler, usually becoming completely glabrous at maturity; terminal leaflet oval; petioles and rachises glabrous, except for several glands and frequently a few long trichomes at the bases of the leaflets; inflorescence flat-topped, 6–15 cm. broad, densely 125–200-flowered; pedicels and peduncles essentially glabrous; bracts caducous; flowers about 5–6 mm. in diameter; petals oval, 3–4 mm. long, cuneate at the base; sepals triangular, acute, 1 mm. long, sometimes with minute dark sessile marginal glands; stamens 15–20, shorter than the petals; ovary pubescent on top; styles 3, equalling or only slightly shorter than the stamens, 2 mm. long; fruit 4–6 mm. in diameter, globose, bright red, glossy, acid, ripening in August; seeds lanceoloid, asymmetrical, chestnut brown, 3 mm. long, 2 mm. wide.

TYPE LOCALITY: Northeastern North America, probably Pennsylvania. "This grows naturally upon the mountains towards Canada." (Marshall, l. c.)

RANGE: Newfoundland to northeastern Minnesota, southward across northern Illinois to eastern Tennessee and North Carolina.

NEWFOUNDLAND: Grand Falls, *Fernald & Wiegand 5660* (G), *5657* (G, A, Can, NY); Frenchman's Cove, *Mackenzie & Griscom 10322* (G); Bonne Bay, *Kimball 106* (G); Channel, *Howe & Lang 976* (G); Conception Bay, *Howe & Lang 1202* (NY); Miller Junction, *Fernald & Wiegand 5658* (G); Glenwood, *Fernald & Wiegand 5659* (G); St.

Johns, July 16, 1902, *Dame* (G); Cow Head, *Fernald & Wiegand 3550* (G); Bay of Islands, July 21, 1902, *Dame* (A); Brig Bay, *Fernald et al. 28490* (G, A). QUEBEC: Harbour Island, *Abbe 1239* (G); Lac Tremblant, July 21, 1922, *Churchill* (G); Ascot, July 29, 1923, *Chamberlain & Knowlton* (G); Black Lake, *Fernald & Jackson 12105* (G); Riviere Romaine, *Marie-Victorin & Rolland-Germain 20906* (G); Romaine, July 8, 1915, *St. John* (G, Can); Gaspé Bay, August 23, 1897, *Jack* (A); Lake St. John, August 22, 1895, *Jack* (A); Lac des Roches, *Marie-Victorin 5516* (A); Anticosti Isl., *Marie-Victorin & Rolland-Germain 27369* (A, G); Gatineau River, *Macoun 4574* (NY); Calumet, *Macoun 8189* (Can). PRINCE EDWARD ISLAND: Charlottetown, *Fernald & St. John 7573* (A, Can, US). NEW BRUNSWICK: Fredericton, *Jack 596* (A); Campobello Isl., *J. D. Smith* in 1888 (US). NOVA SCOTIA: Clementsport, *Jack 3700* (A, G); Sissiboo River, *Fernald et al. 21426* (G); Barasois River, Cape Breton Isl., *Nichols 1178* (G); Baddeck, *Macoun 19085* (G, Can); Folly Lake, September 29, 1917, *Jack* (A); Halifax, *Jack 674, 3240* (A), *Howe & Lang 1472* (G, NY); Salmon Lake, *Fernald, Long & Linder 21428* (A, Can, G); Barton, *Jack 3342* (A); Bedford, July 3, 1883, *Macoun* (Can), *Jack 3320* (A); Pleasant Valley *Jack 3163* (A); Fall River, *Jack 3314* (A); Yarmouth, *Jack 3872* (A); Shelburne, *Jack 3459* (A); Digby, *Howe & Lang 250* (NY); Springville, *C. B. Robinson 505* (NY). MAINE: St. Francis River, August 12, 1902, *Eggleston & Fernald* (A, G, NE); Mt. Desert, June 27, 1890, *Redfield* (US); Pleasant Pond, August 18, 1902, *Collins & Chamberlain* (G, NE); Monhegan Isl., August 29, 1901, *Churchill* (G); *Jenney, Church & Hill 3159* (NE); Grand Isle, *Fernald 2304* (NE); Mount Katahdin, July 14, 1900, *Fernald* (NE); Mount Kineo, *Cushman 1925* (NE); St. John Pond, *St. John & Nichols 2331* (NY, NE); Brooklin, *Hill 571* (NE); Duck Harbor, *Hill 1737* (NE); South Poland, *Furbish* in 1893 (NE); Orono, *Briggs* in 1893 (NY). NEW HAMPSHIRE: Randolph, *Pease 18085* (NE); Pittsburgh, *Pease 10829* (NE); Mount Washington, *Jack 2478* (A); Jaffrey, *Robinson 624* (G, NE); Rindge, *Batchelder* in 1913 (NY); East Hebron, July 18, 1917, *Wilson* (NY). VERMONT: Chittenden, *Eggleston 195* (US, G); Mt. Mansfield, August 6, 1902, *Rehder* (A); Long Pond, June 11, 1895, *Westmore* (G); Willoughby, June 16, 1898, *Williams* (G); Woodford, June 20, 1925, *Carpenter, Churchill & Knowlton* (NE); Middlebury, June 13, 1879, *Brainerd* (NY). MASSACHUSETTS: Princeton, *Pease 724* (NE); Ashburnham, August 8, 1908, *Knowlton* (NE); Williamstown, September 8, 1897, *Churchill* (NE); Worthington, *Robinson 670* (G); Mount Watatic, Ashby, August 9, 1908, *Knowlton* (G). CONNECTICUT: Dur-

ham, *Blewitt 1775* (NE); Meriden, July 20, 1913, *Bissell* (NE); Winsted, July 5, 1912, *Blewitt* (NE); North Canaan, *Blewitt 665* (NE). NEW YORK: Black Bear Mountain, *Killip 7143* (A, US), *31783* (A); Lake Placid, August 9, 1902, *Rehder* (A); Lake George, July 31, 1900, *Burnham* (G); Long Lake, *House 10217* (G); Plymouth, *Wiegand 6581* (G); Colton, *Phelps 1411* (NY, G); Rome, *Muenscher 14768* (G); Olean, *Muenscher 15584* (G); Hunter Mountain, *Muenscher et al. 15566* (G); Turnwood, August 12, 1891, *Rusby* (NY); Slide Mt., May 31, 1901, *Britton* (NY); Catskill Mts., *Britton* in 1898 (NY). NEW JERSEY: High Point, *Mackenzie 4652* (G, NY); Mt. Hope, *Tompkins* (NY). PENNSYLVANIA: Lenhartsville, *Long 12894* (G); Pocono Plateau, August 1904, *Harshberger* (G), *Small* in 1889 (NY); Bangor, September 5, 1908, *Bartram* (A); Port Allegheny, September 7, 1928, *Gable* (A); Laporte, *Eggleston 22696* (US). MARYLAND: Garrett Co., June 28, 1882, *J. D. Smith* (US); Oakland, *Tidestrom 6436* (US). WEST VIRGINIA: Panther Mountain, *Rydberg 9028* (A, NY); Aurora, August 18, 1898, *Steele* (A, NY, US); Cheat Valley, August 27, 1907, *Rehder* (A); Stony River Dam, *Core 6776* (NY, G); mont. Virg. Carol. Sept., July 1841, *Gray & Carey* (G, US); Spruce Knob, *Rydberg 9185* (NY), *Greenman 148* (G), *Millspaugh 1624* (NY). VIRGINIA: Peaks of Otter, September 1, 1871, *Curtiss* (G), *Eggleston 18636* (US); Stony Man Peak, *Steele 136* (G, US, NY); Crescent Rocks, *Camp 1260* (NY). NORTH CAROLINA: Grandfather Mountain, *Randolph 1191* (G), *Small & Heller 298* (US, NY), *Rydberg 9348* (NY), *Curtis* (NY, the type of *Pyrus americana β microcarpa* Torr. & Gray); Craggy Mountain, *Biltmore Herbarium 486* (G, A, US, NY); Roan Mountain, September 24, and September 27, 1885, *Sargent* (A); Highlands, *Harbison 80* (A). TENNESSEE: New Found Gap, June 27, 1931, *Jennison* (US). MICHIGAN: Emerson, *Dodge 15* (A); Pellston, *Gates 14883* (A); Turin in 1901, *Barlow* (A, NY); Vermillion, *Dodge 12* (A). ILLINOIS: Oregon, June 6, 1888, *Waite* (US). WISCONSIN: Newbold, *Palmer 28692* (US, A); Rhinelander, *Palmer 28703* (A, US); Wheeler, *Palmer 28561* (A); Kilbourn, *Palmer 28415* (A); Star Lake, September 1901, *Denniston & Timberlake* (G); Antigo, August 1898, *Cheney* (G); Sturgeon Bay, July 11, 1885, *Schuette* (G); Newport, June 24, 1883, *Schuette* (NY). MINNESOTA: Duluth, September 16, 1882, *Faxon* (A); Vermillion Lake, *Arthur, Bailey & Holway B315* (G); Grand Marais, *Rydberg 9612* (NY), *Butters & Buell 477* (G, US, NY); Mineral Center, *Rosendahl & Butters 4583* (G, NY); Crab Lake, *Butters* in 1918 (NY).

Sorbus americana is apparently the commonest eastern North American species. The flowering period is May and June. Fruits are ripe in

late August and September, persisting into the winter. It is abundant in rich rather moist soil along the borders of swamps, and on rocky hillsides. It grows also along riverbanks, and in cool mountain woods. In the autumn the tree is very attractive on account of the conspicuous yellowish leaves and red fruits. This species can be distinguished from *S. decora,* which has a similar range, and with which there has been some confusion in the past, by its smaller flowers with the stamens shorter than the petals, the smaller fruits and seeds, and by the narrow, linear-lanceolate to lanceolate, acuminate, finely toothed, usually glabrous leaflets. Hybrids between *S. americana* and *Aronia melanocarpa* are known in cultivation, although I have seen no specimens of spontaneous American plants. If a hybrid-genus name is used it would be written × *Sorbaronia sorbifolia* (Poir.) Schneid. In this issue of the Journal of the Arnold Arboretum, p. 95, Professor Rehder describes a hybrid between *Sorbus americana* and *Aronia prunifolia.*

The nomenclatural history of this species, and of the somewhat distantly related *S. decora,* is rather complex. As previously noted, *S. americana* was first described by Marshall in 1785. André Michaux in 1803, overlooking or ignoring Marshall's work, characterized the two native northeastern American mountain ashes as varieties α and β of *S. aucuparia* L. The variety α was said to have "foliis acuminatis," and habitat "in excelsis montibus Carolinae." This is obviously *S. americana* Marsh. The var. β was characterized by "foliis sensim acutis," and the habitat "in Canada et circa lacum Ontario." Plainly, this is the northern shrub we now call *S. decora.* In 1809 Willdenow published as a new species *S. americana,* citing "*S. aucuparia* Mich." as a synonym and giving the habitat "in montibus excelsis Carolinae," evidently quoting from Michaux. In doing this possibly he was unaware of the earlier publication of *S. americana* Marsh., or at any rate he did not refer to it. The var. α and var. β of Michaux were evidently regarded as identical, and in combining them he selected the var. α as the principal element, as is indicated by his statement of habitat. From the description "S. foliis pinnatis, foliolis subaequaliter serratis petioloque communi glaberrimus" there is nothing more to be learned about the character of the specimens he may have had in hand, since the statement will apply equally to almost any species of *Sorbus,* and the supplementary remark "Baccae purpureae nec coccineae" is an attempt to contrast the color of the fruits with that of *S. aucuparia.* So far, then, the case is clear: *S. americana* Willd. 1809 = *S. Aucuparia* Var. α Michx. 1803 = *S. americana* Marsh. 1785. Pursh in 1814 was the first to recognize the fact that there are two distinct species native to northeastern North

America, each entirely different from the other and from the European *S. aucuparia* L. The northern plant with acute leaflets and large fruits Pursh called *S. americana,* citing Willd. Enum. Plant. 520, from where he copied the description. To this description, however, he made the important addition "foliolis acutis," citing *S. Aucuparia* var. β Michx. as a synonym, and giving the habitat "In Canada and on some of the northern mountains." All this refers unmistakably, of course, to *S. decora* (Sarg.) Schneid., and confirms the fact that *S. americana* Pursh is not *S. americana* Marsh. It is interesting to notice that Pursh has copied from Willdenow the statement "Berries purple, not scarlet as in the European species." Pursh designates the other native eastern North American shrub (the one with acuminate leaflets, small fruits, and a more southerly range), by the new name *S. microcarpa.* He cites *S. Aucuparia* α Michx. as a synonym, gives the habitat and range "On the peaks of high mountains: New Jersey to Carolina," and adds the comment "This species is very distinct from the Canadian *Sorbus.*" i.e., his *americana,* which, as previously pointed out, is *S. decora* (Sarg.) Schneid., but not *S. americana* Marsh. In 1825 A. P. De Candolle transferred these species to *Pyrus,* but unfortunately the name *Pyrus americana* DC., designating the northern shrub with acute leaflets and large fruits, is based upon *Sorbus americana* Pursh, and therefore is not synonymous with *S. americana* Marsh.

Hedlund (l. c.) rejects the name *Sorbus americana* Marsh. as a nomen dubium and accepts instead *S. microcarpa* of Pursh. While Marshall's description is not as definite as might be desired, nevertheless there seems to be no compelling reason for upsetting the usage of more than a century and a half in order to adopt a name that is only slightly less vague in its exact application. In any event the name *S. microcarpa* is three years later than *S. micrantha* of Dumont de Courset. There is scarcely any doubt as to the identity of Marshall's species since it is the only native feral *Sorbus* occurring in Pennsylvania, where Marshall had his garden, and from where, presumably, he secured his specimens.

Perhaps it would not be out of place to parenthetically note the fact that many of the references in Sargent's Silva (l. c.) under *Pyrus americana* really belong to *S. decora.*

4. **Sorbus scopulina** Greene, Pittonia **4:** 130. 1900; Hedlund, Svenska Vet.-Akad. Handl. **35:** 138. 1901; Rydberg, Fl. Colorado 193. 1906; Schneider, Ill. Handb. Laubholzk. **1:** 677, *fig. 372 c-f.* 1906; Coulter & Nelson, New Man. Rocky Mt. Bot. 269. 1909; Wooton & Standley, Contr. U. S. Nat. Herb. **19:** 324. 1915; Ryd-

berg, Fl. Rocky Mts. 448. 1917; Tidestrom, Contr. U. S. Nat. Herb. **25**: 284. 1925; Kirkwood, N. Rocky Mt. Trees Shrubs 197, *f. 40, pl. 25*. 1930; Rydberg, Fl. Prairies Plains 438, *f. 291*. 1932; Graham, Ann. Carnegie Mus. **26**: 244. 1937.

Pyrus americana sensu Cooper, Am. Nat. **3**: 406. 1870. Non DC., 1825.

Pyrus sambucifolia sensu Watson in U. S. Geol. Explor. **5**: 92. 1871; Porter & Coulter, Syn. Fl. Colorado 48. 1874; Coulter, Man. Bot. Rocky Mt. Region 89. 1885. Non Cham. & Schlecht., 1827.

Sorbus sambucifolia sensu Rydberg, Contr. U. S. Nat. Herb. **3**: 498. 1896, Mem. N. Y. Bot. Gard. **1**: 227. 1900; Standley, Contr. U. S. Nat. Herb. **22**: 366. 1921. Non Roemer, 1847.

Pyrus sitchensis Piper, Contr. U. S. Nat. Herb. **11**: 347. 1906, ex parte; Piper & Beattie, Fl. SE. Wash. Adj. Idaho 134. 1914.

Sorbus angustifolia Rydberg, Fl. Rocky Mts. 448. 1917; Rehder, Man. Cult. Trees Shrubs 377. 1927. *Synon. nov.*

Sorbus sitchensis var. *densa* Jepson, Man. Fl. Pl. Calif. 508. 1925.

Pyrus scopulina Longyear, Trees Shrubs Rocky Mt. Reg. 152. 1927.

Sorbus dumosa sensu Raup, Contr. Arnold Arb. **6**: 174. 1934. Non Greene, 1900.

Sorbus sitchensis sensu Raup, Jour. Arnold Arb. **17**: 264. 1936. Non Roemer, 1847.

Pyrus dumosa sensu St. John, Fl. SE. Wash. Adj. Idaho 205. 1937. Non Fernald, 1921.

A shrub 1–4 m. tall, sometimes forming dense clumps; bark thick, reddish; winter-buds glossy, glutinous, the scales brown, glabrous or sparsely whitish-pilose dorsally, ciliate on the margins; young twigs sparingly pilose; stipules membranous, glabrous; leaflets 11–13, the lateral lanceolate or oblong-lanceolate, 3–6 cm. long, 1.2–2 cm. wide, 3–5 times as long as wide, cuneate at the base and slightly oblique, sharply acute or shortly acuminate at the apex, the margins finely and sharply simply or doubly serrate from the apex almost to the base, the teeth ovate-lanceolate, sharply acuminate, not at all glandular or callose at the tips; glabrous on both surfaces at least when mature, the upper surface dark green and glossy, perfectly glabrous, reticulate-rugose when fresh, paler beneath; terminal leaflet oval; petioles and rachises glabrous or nearly so, except for a few glands and several long trichomes at the bases of the leaflets; inflorescence dense, flat-topped, 9–15 cm. broad, 80–200-flowered; pedicels and peduncles sparingly pilose; flowers fragrant, about 1 cm. in diameter; calyx pilose, the sepals triangular, acute, 1.5 mm. long; petals oval, 5–6 mm. long, about as long as the stamens; styles 3–4, 2–2.5 mm. long, about half the length of the stamens; top of the ovary pubescent; fruit orange or scarlet, glossy, not glaucescent, globose, 8–10 mm. in diameter, bitter; seeds oblong, almost symmetrical, light brown, 3.5–4 mm. long, 1.5–2 mm. wide.

TYPE LOCALITY: Near Pagosa Peak, altitude 9000 feet, Colorado. Collected by C. F. Baker, August 10, 1899.

RANGE: British Columbia and Alberta to South Dakota, eastern Washington and southward to New Mexico.

BRITISH COLUMBIA: Cariboo, *Macoun 8215* (Can); Yale, *Macoun 8209* (Can); Yellowhead Pass, *Macoun 19335* (Can); Chilliwack Lake, *Spreadborough 79775* (Can); Moose Pass, *Hollister 47* (US); Donald, July 18, 1887, *Macoun* (NY); Glacier, August 12, 1897, *Sargent* (A), *Brown 256* (US, NY), *Snyder 545* (US, NY), *Butters & Holway 727* (G); Emerald Lake, *Shaw 69* (US, NY), *Shaw 1114* (G, NY, US), *Peterson 132* (US, NY); Revelstoke, *Shaw 813* (US, NY, G); Rocky Mt. Canyon, *Raup & Abbe 3750* (A, Can); Stikine River, July 10, 1919, *Swarth* (UC); Lake Atlin, September 7, 1930, *Setchell & Parks* (UC); Waldie Creek, *MacFadden 13892* (UC); Klappan River, *Preble & Mixter 655* (US). ALBERTA: Assineau River, *Brinkman 4395* (NY); Atauwau River, *Brinkman 4181* (NY); Vermilion Mt., *McCalla 2099* (US, NY), August 1899, *Sanson* (CA, Can); Lake Athabaska, *Raup 4470, 4584, 4659* (G); Little Slave Lake, *Macoun 1574* (Can); Kicking Horse Pass, *Macoun 1575a* (Can). SASKATCHEWAN: Lake Athabaska, *Raup 6425, 6799, 6930* (G), *Laing 210* (US). SOUTH DAKOTA: Deadwood, *Hayward 247* (NY), *Palmer 37611* (A, NY); Strawberry Gulch, *Murdoch 3090* (G, NY); Lawrence Co., *Over 13687* (US); Watertown, *Over 15917* (A). MONTANA: Bridger Mts., *Flodman 546* (NY, US), *Rydberg & Bessey 4427* (G, NY, US), June 27, 1901, *W. W. Jones* (A, US, UC), *Blankinship 159* (US); Neihart, *Williams 851* (US); Sinyaleamin Lake, *MacDougal 328* (NY, US); Midvale, *Umbach 96* (NY, US); Two Medicine Lake, *Standley 15027* (US); Glacier Park Station, *Standley 17706* (US); Belton, *Standley 18641, 18642* (US), *Jack 1607* (A); Many Glacier, August 25, 1921, *Susan D. McKelvey* (A), *Jack 2003* (A); Lake McDonald, *Jack 2338* (A), September 16, 1921, *Susan D. McKelvey* (A), July 16, 1909, *M. E. Jones* (NY); Gunsight Lake, *Jack 2244* (A); Grant Creek, *Kirkwood 31* (A); Marshall Gulch, *Kirkwood 31a* (A); MacDougal Peak, July 30, 1908, *Mrs. J. Clemens* (G, A), *M. E. Jones 8141* (US); Flathead Lake, August 10, 1908, *Mrs. J. Clemens* (G, A); Avalanche Lake, July 17, 1896, *Sargent* (A), *Jack 2292* (A); Logan Pass, *C. L. Hitchcock 1944* (G); St. Mary, *Jack 1522* (A); St. Mary Lake, *Standley 17070* (US); Livingston, September 20, 1892, *Kelsey* (NY); Helena, *Kelsey* (UC); Columbia Falls in 1894, *Williams* (G, NY); Bozeman, June 26, 1900, *Blankinship* (UC). IDAHO: Cedar [Moscow] Mt., *Sandberg, MacDougal & Heller 421* (G, US, NY),

Elmer 350 (US, NY, A), August 1896, *Elmer* (A), *Abrams 664* (UC, NY, A), *Jack 1265* (A), *Henderson 2688* (G, US), *Eggleston & St. John 21984* (US), July 1898, *Piper 1527* (TYPE of *S. angustifolia* Rydb., NY; ISOTYPE, G); Bohannan Creek, *Henderson 4037* (US); Wiessners Peak, *Leiberg 1381* (US); Alturas Lake, *Evermann 497* (US); Bascom's Ranch, Elmore Co., *Macbride 629* (G, NY, US, UC); Silver City, *Macbride 1013* (NY, US, UC, G); Pinehurst, *Macbride 1677* (US, G, UC); Beaver Canyon, *Shear 3131* (US, NY); Seven Devils Mts., August 5, 1899, *M. E. Jones* (NY); Quartzburg, July 24, 1892, *Mulford* (NY, A); St. Maries, *House 4921* (US); Sohons Pass, *Leiberg 1381* (G, NY, A, UC); Hope, *Munson & Hopkins* in 1889 (US); Little Skeleton Creek, *Woods & Tidestrom 2572* (US); divide between St. Joe & Clearwater rivers, *Leiberg 1194* (NY, A, UC, US); Kootenai Co., *Sandberg 4326* (NY); Little Dry Creek Canyon, *Rust 675* (CA); Elk Butte, *Jack 1333* (A); Elk River, *Jack 1300* (A); Lake Waha, *Heller 3275* (NY, US, A, UC); Priest Lake, July 28, 1896, *Sargent* (A), *MacDougal 154* (NY); Pend Oreille River, *D. Lyall* in 1860 (G). WYOMING: Copperton, *Tweedy 4182* (US, NY); Leighs Lake, *Merrill & Wilcox 987* (US); Piney Creek, August 28, 1900, *Jack* (A); Hidden Falls, *Williams 866* (NY, CA); South Spring Creek, *Eggleston 11290* (US); Centennial, *Nelson 10114* (UC); Lander, *Nelson & Nelson 360* (UC); Battle Lake, *Nelson & Nelson 350* (NY, G, UC); Teton Pass, *Merrill & Wilcox 981* (G, NY); Bighorn Mts., *Tweedy 2538* (NY); Teton Mts., *Nelson 982* (NY, G, US); Green River, October 1870, *Hayden* (G, NY); Elk Mountain, Carbon Co., *Goodding 553* (A, G, US, UC, NY); Gros Ventri River, *Tweedy 198* (NY); *Yellowstone National Park*: Firehole River, September 3, 1904, *Rehder* (A); Yellowstone Lake, July 20, 1902, *Scheuber* (US), *A. Nelson & E. Nelson 6333* (US, G, NY); Mammoth Hot Springs, *Mearns 4602* (US, NY); 12 miles east of Old Faithful, *Maguire 1177* (UC); without definite locality, *Mearns 4238* (G, US). UTAH: east of Gunnison, *Ward 668* (G, US); Peterson, *Pammel & Blackwood 3819* (G, A); Sierra la Sal, *Purpus 7039* (US, UC); Mt. Timpanogos, *Maguire 3648* (UC); Timpanogos Canyon, *Palmer 38092* (A); Mt. Nebo, *Rydberg & Carlton 7576* (US, NY); Mt. Pleasant, *Tidestrom 1868* (US); Salt Lake, *Eastwood 7748* (A, CA); Wasatch Mts., *Watson 351* (US, G, NY); Immigration Gap, *House 5045* (NY); Provo, *M. E. Jones 5583* (US, UC, NY, A), *Goodding 1153* (US, G, UC, NY); Ogden, *A. S. Hitchcock 1449* (US); Logan, August 9, 1895, *Rydberg* (NY), *Shear 3173* (NY); American Fork Canyon, *M. E. Jones 1369* (A, NY); East Bountiful, September 22, 1909, *Mrs. J. Clemens* (CA, NY); Red Butte,

June 9, 1908, *Mrs. J. Clemens* (A); Big Cottonwood Canyon, *Rydberg & Carlton 6611* (G, NY), *Garrett 1346* (G). COLORADO: Pagosa Peak, *Baker 403* (A, G, US TYPE, UC, NY); Columbine, *Cary 77* (US); Rabbit Ear Range, *Goodding 1578* (A, US, G, UC, NY); Rabbit Ear Pass, *Nelson & Nelson 340* (UC); Telluride, *Tweedy 221* (US); Tolland, *Palmer 31401* (A); Mt. Carbon, *Eggleston 5737, 6184* (US), *Tidestrom 3809, 4060* (US); Victoria, *Tweedy 4181* (US, NY); Elk Mts., *Brandegee* in 1881 (UC); Minnehaha, *Johnston 2547* (UC); Wolf Creek Pass, *Eggleston 20540* (NY), *Wolf 3068* (G, CA), *Susan D. McKelvey 4727* (A); Dry Creek, Uncompahgre Nat. Forest, *Tidestrom 1543* (US); Uncompahgre Plateau, *Maguire 12821* (UC); Buffalo Pass, *Shear & Bessey 3937* (NY); Four Mile Hill, Routt Co., July 22, 1896, *Baker* (NY); Sierra La Plata, *Brandegee 1148* (UC); Empire, *Tweedy 5762* (NY); Palmer Lake, August 12, 1896, *Crandall* (NY); Douglas Creek, *Graham 9697* (US); Upper La Plata Canyon, *Baker, Earle & Tracy 653* (A, G, US, NY); Granite Peaks, *Susan D. McKelvey 4688* (A); Ouray, *Baker 757* (NY, G, US), *Underwood & Selby 107* (NY), June 22, 1892, *Crandall* (G, NY), *Shear 4147* (NY, US). NEW MEXICO: Rio Medio, *H. P. Baker* in 1906 (US); Brazos Canyon, *Standley & Bollman 10808* (US). WASHINGTON: Nason Creek, *Sandberg & Leiberg 683* (US, CA), *638* (A, UC, NY); Scotia, *Jack 1475* (A); east of the Cascade Mts., *Wilkes Expedition 489* (US); Mt. Stuart, *Elmer 1269* (A), *Whited 811* (US); Easton, *Whited 424* (US), *Roell,* June 8, 1888 (A); Fish Lake, Kittitas Co., *Thompson 10658* (US, A, CA, G); Swauk River, *Sharples 109* (G); Mica Peak, *Suksdorf 8818* (A); Mt. Carleton, *Kreager 265* (US, G, NY); Blue Mts., *Horner 181* (US), *B181* (G), *Sargent,* July 31, 1896 (A); Mt. Adams, October 1, 1881, *Suksdorf* (US), *7096* (A); Yakima region *Brandegee* in 1882 (UC). OREGON: Hood River, September 1896, *Langille* (A); Mt. Hood, August 20, 1896, *Sargent* (A), *Heller 14721* (US, NY); between north and south Umpqua Rivers, alt. 5000 ft., *Applegate 2686* (US); Bone Springs, Wenaha Nat. Forest, *Lawrence 199* (US); Strawberry Range, *Mason 3526* (UC); Fish Lake, *Applegate 2496* (US); Huckleberry Mt., *Applegate 390* (A, US), *375, 1438* (US); Four Mile Lake, *Coville & Applegate 253* (US); Upper Metolius River, *Coville & Applegate 697* (US); Elgin, *Sheldon 8736* (A, US, NY); Crater Lake, *Gorman 41* (US), *Thompson 12298* (CA, US, A); John Day River, September 10, 1896, *H. E. Brown* (US, NY); Cornucopia, *Thompson 13414* (A, NY); Steins Mts., *Leiberg 2518* (UC, NY, US); Black Butte, *Cusick 2690* (US, UC); Lost Creek Valley, *Gorman 1823* (US). CALIFORNIA: Shackleford Creek, *Butler*

1681 (UC, US); Woolly Creek, *Butler 281* (UC, paratype of *S. sitchensis* var. *densa* Jeps.); Cliff Creek, *Culbertson 4674* (A, CA, UC, US, NY); Gold Lake, August 1919, *Mrs. E. C. Sutcliffe* (US, CA); Kaweah River, July 20, 1913, *Rixford* (A, CA); Grass Lake, *McGregor 98* (US, NY); Lassen Buttes, *Brown 660* (NY, US).

This is the species that was called *Sorbus sambucifolia* or *Pyrus sambucifolia* by the botanists of the nineteenth century. It is the commonest one in the western part of North America. Its habitat is chiefly canyons and wooded hillsides, and it is frequent up to an altitude of 10,000 feet. Throughout most of its range it occurs chiefly in the Canadian zone. It has the most extensive distribution of any western North American species.

Certain specimens from northern Idaho show a tendency to have slightly narrower and somewhat longer leaflets; these have been treated by Dr. Rydberg as a separate species, *S. angustifolia*. It is illustrated in Schneider's Ill. Handb. Laubholzk. *fig. 372f*. The type locality of this species is [Cedar] Moscow Mountain, so-called, one of the Thatuna Hills in Latah County, northern Idaho. At first glance this *S. angustifolia* appears to be a distinctive entity but close observation and an examination of a larger series of specimens than were available to Rydberg, shows that the leaflet character breaks down completely, and the plants intergrade with typical *S. scopulina*. This conclusion is based on the study of a large series of specimens, and Rydberg's type, as well as personal collections of material in the type region over a period of several years.

The herbarium specimen *Allen 291* (distributed as *Pyrus sambucifolia*) contains a mixture of *S. scopulina* and *S. cascadensis*. The flowering specimens belong, evidently, to *S. scopulina;* the fruiting specimen is of *S. cascadensis*. This mixture was noted by Schneider in 1906 (Bull. Herb. Boiss. II. **6:** 314), but he erroneously ascribed the specimens with oval leaflets to *S. californica,* a species endemic to California, with smaller leaflets, glabrous pedicels, and the ciliations of the bud scales somewhat ferrugineous. The specimens of *S. scopulina* distributed with *Allen 291* are almost certainly not from native plants from Mount Rainier, but came, probably, from the eastern slope of the Cascade Mountains, or possibly from Mr. Allen's garden, situated between Longmire and Ashford, Washington. I found several different kinds of cultivated plants persisting near the remains of the Allen cabin as late as 1935, and among them were two or three species of *Sorbus*. On the lower slopes of the eastern watershed of the Cascade Mountains *S. scopulina* is conspicuous and not uncommon, and is in fact the only

species of the genus occurring there, but no authentic collections have come to hand from the region west of the summit of that range, neither has their existence been disclosed by personal field work in that region during a period of ten years.

Specimens of *S. scopulina* have been frequently misidentified as the wholly different *S. sitchensis,* which occurs in the United States only in northern Montana and adjacent Idaho. *Sorbus scopulina* can be readily distinguished by its acute or acuminate, glossy, oblong-lanceolate or elongate-oval leaflets with the serrations extending almost to the base, and by the glossy, bright scarlet, globose fruits. The pubescence of the pedicels and leaf-buds consists of whitish trichomes. In *S. sitchensis,* the oval, usually obtuse or obtusish leaflets are dull, the fruits are ellipsoid or subglobose, dull and glaucescent, and the pubescence is ferrugineous. In addition, the inflorescence is smaller, convex rather than flat-topped, and the stamens are shorter than the petals.

Following is an account of two natural intergeneric hybrids between *S. scopulina* and *Amelanchier florida* Lindl.

× **Amelasorbus Jackii** Rehder, Jour. Arnold Arb. **6:** 154. 1925. *Amelanchier florida* Lindl. × *Sorbus scopulina* Greene. IDAHO: summit of Elk Butte, Clearwater Co., alt. about 2000 m., September 4, 1918, *Jack* 1329. Professor Rehder's comments on this bigeneric hybrid are as follows: "In general appearance the original specimens as well as the plants growing in the Arnold Arboretum have the aspect of a vigorous plant of *Amelanchier,* and only on closer inspection one may notice the presence of partly pinnate leaves and the compound inflorescence. The flowers, too, with their oblong upright petals look much like those of *Amelanchier,* but the styles are distinct, and the false partitions of the fruit extend only to about the middle of the locule and are abnormally thick in the sterile cells."

"The parents of the hybrid are apparently *Sorbus sitchensis* Roem. and *Amelanchier florida* Lindl. of which specimens were collected on the same date at the same locality; the first species being represented by Jack's no. 1333 and the second by his no. 1332. From *Sorbus sitchensis* the hybrid is easily distinguished by the mostly simple leaves, smaller, not viscid, winterbuds, the smaller paniculate inflorescence with racemose not corymbose branches, the oblong petals, 4–5 styles, and by the dark colored pruinose fruit with long ovate-lanceolate sepals. From *Amelanchier florida* the hybrid differs chiefly in the larger, more coarsely serrate and occasionally partly pinnate or lobed leaves, in the villous apex of the bud-scales, in the compound inflorescence, shorter petals, distinct styles and in the larger fruit with upright or nearly up-

right sepals, with shorter false partitions and with dry flesh of poor flavor as noted by the collector."

The type specimen and several additional sheets of × *A. Jackii* have been studied by the present writer; also a living plant in the Arnold Arboretum. Mr. Jack's specimen of the *Sorbus* that is presumably one of the parents of the hybrid (*Jack* 1333) also has been available for study. A critical examination of this specimen leads to the conclusion that it is better referred to *S. scopulina* Greene, rather than to *S. sitchensis* Roem. It is true that the leaflets are somewhat broader than those of most specimens of *S. scopulina,* but the large, flat-topped cluster of bright red, globose fruits, the glabrous petioles and rachises, and the glossy leaflets all demonstrate the specimen to belong to *S. scopulina,* the common species in the State of Idaho.

Additional specimens of × *Amelasorbus Jackii* Rehd. have been collected in the Wallowa Mountains of Oregon. These were discussed and illustrated by Rydberg in 1927 (Jour. N. Y. Bot. Gard, **28**: 227–228), but apparently he overlooked Rehder's article since no mention was made of it, nor were the specimens named. Dr. Rydberg's description is quoted in part as follows: "The sheet bears the number 1380 and is erroneously labeled *Pyrus sambucifolia.* . . . It is probably a hybrid between the Western Mountain Ash, *Sorbus occidentalis,* and a species of Juneberry, *Amelanchier.* The leaves have the light green color of *S. occidentalis,* but are thinner. Some of the earlier leaves are simple, but the rest are pinnate below, with 2 or 3 pairs of leaflets, which are like those of *S. occidentalis,* entire-margined below and dentate towards the apex. The terminal leaflet is much larger, broader, more toothed, and often lobed. The inflorescence is compound as in *Sorbus,* but the young fruit resembles that of *Amelanchier.*" Rydberg then concludes, and probably correctly, that the *Amelanchier*-parent is *A. florida* Lindl. It is almost certain, however, that the Sorbus-parent is *S. scopulina* rather than *S. occidentalis,* since the latter species is not known to occur in the Wallowa Mountains, or indeed anywhere within a distance of more than one hundred miles of them, whereas *S. scopulina* is common in that locality. Furthermore, the kind of pubescence, and the shape, texture, and serration of the leaf-segments of the Cusick specimens in the United States National Herbarium point unmistakably to *S. scopulina* and bring out more clearly than is done in Rydberg's illustration the obvious *scopulina*-character of the plants. The following specimen has been examined. OREGON: mountainsides near Cornucopia, *W. C. Cusick 1380* (US). Rydberg says (l. c.) that there is a duplicate sheet in the herbarium of the University of Minnesota.

5. **Sorbus alaskana** n. sp. Plate 226

Frutex; gemmae et ramuli juniores pilosi; folia 5–6-juga; foliola oblongo-lanceolata, 2–3-plo longiora quam lata, acuta, 3–5 cm. longa, 1–2 cm. lata, argute serrata, glabra; petioli rhachidesque glabri vel parce pilosi; corymbi circiter 3–6 cm. lati, convexi, ramis pilosis pilis brevibus albidis, flores 20–40, 6–8 mm. lati; hypanthium campanulatum, 3 mm. longum, sparse pilosum, sepala triangularia acuta ciliata 1 mm. longa; petala ovalia 5 mm. longa; stamina petala subaequantia; styli quatuor, 2 mm. longi; ovarium apice hirsutum; fructus globosi, 8–10 mm. crassi, coccinei; semina ovalia badia 4 mm. longa.

A shrub; winter-buds conical, glutinous, the outer scales ciliate, the inner pilose with whitish trichomes, as are also the young twigs; lenticels elliptical, scattered; leaflets 11–13, completely glabrous on both surfaces at maturity, the lateral ones widely spreading from the rachis at about a right angle when mature, firm, oblong-lanceolate, acute, 3–5 cm. long, 1–2 cm. wide, 2–3 times as long as wide, the lowermost pair usually somewhat smaller; margins sharply and regularly serrate almost to the base; upper surface dark green, glossy, glabrous at maturity, lower surface very slightly paler; terminal leaflet oval; petioles and rachises very sparsely pilose, or usually glabrous except for a few glands and often a few whitish trichomes on the upper side of the grooved rachis at the base of the leaflets; inflorescence roundish, compact, 3–6 cm. broad, less than 40-flowered; pedicels and peduncles pilose with whitish trichomes at flowering time; flowers 6–8 mm. in diameter; calyx sparsely pilose, the sepals triangular, acute, sparsely ciliate, 1 mm. long; petals oval, 4 mm. long, about the length of the stamens; styles 3–4, 2 mm. long, about half the length of the stamens; top of the ovary copiously pubescent; fruit bright red, subglobose, 8–10 mm. in diameter, less than 25 in a corymb; seeds oval, brown, 4 mm. long.

TYPE LOCALITY: Lake Iliamna, Alaska. Collected by M. W. Gorman in 1902.

RANGE: Alaska, from the head of Lynn Canal, westward to the upper Alaska Peninsula, northward to the lower Yukon valley.

ALASKA: Haines, *Scheuber*, July 1909 (US), *Anderson 828* (NY); Talkeetner Mts., *Anderson 1072* (US); Kussilof, *W. H. Evans 720* (US); Lake Iliamna region, *Gorman 85, 255* (TYPE US, A); Nushagak, *McKay* in 1881 (US); Kokrines, *Miller 1621* (US); Totanilla Mt., *Collier 132* (US); between Cook Inlet and Tanana River, *Glenn* in 1899 (US); Cook Inlet, *Coville & Kearney 2433* (US); Golovin, *L. J. Palmer 1063* (US); Alaska, without definite locality, *A. Kellogg* in 1867 (US);

Hyder, June 9, 1924, *Whited* (NY); Naknek Lake, July 17, 1919, *A. E. Miller* (US).

This species occurs on hillsides and in open woods. It is very similar in appearance to *S. scopulina* of the Rocky Mountains, especially in its leaf characters. The leaflets are almost identical with those of that species except that they are less glossy. However, the distinctive character that sets *S. alaskana* off at once from *S. scopulina* is its small, compact, rounded, fewer-flowered inflorescence, which in most specimens shows the calyces, pedicels, and peduncles to be much more pubescent than those of the Rocky Mountain shrub. *Sorbus scopulina* is not known to occur in Alaska. The two other Alaskan species are *S. sambucifolia* and *S. sitchensis*. The former is known to occur only on the westernmost islands of the Aleutian Archipelago. It is very distinct from *S. alaskana* in its ferrugineous pubescence, larger fruits and flowers, and the fewer, lanceolate or ovate-lanceolate, acuminate leaflets. *Sorbus sitchensis* has ferruginous pubescence, fewer, oval, obtuse, dull leaflets, a larger inflorescence, and glaucous fruits.

Mr. M. W. Gorman notes that the Kenai Indians use the branches for brooms in and about their houses, caches, and igloos. Also, "The branchlets are heated on hot rocks and used to beat the body in the sweathouses." The fruit is eaten and the bark chewed as a cure for coughs and colds. The native name is "buk-thilsh-nay." Gorman's no. 255 consists of two sheets, one of which contains a sterile specimen with very abnormal foliage. The other one is taken as the type.

6. **Sorbus decora** (Sarg.) Schneider, Bull. Herb. Boiss. II. **6**: 313. 1906, Ill. Handb. Laubholzk. **1**: 676, *f. 371 f-g.* 1906; Rehder in Bailey, Stand. Cyclop. Hort. 3195. 1917, Man. Cult. Trees Shrubs 377. 1927.

Sorbus Aucuparia var. *β* Michx. Fl. Bor. Am. **1**: 290. 1803.

Sorbus americana Pursh, Fl. Bor. Am. **1**: 341. 1814; Roemer, Syn. Mon. 138. 1847. Non Marsh. 1785.

Pyrus americana DC. Prodr. **2**: 637. 1825; Spreng. Syst. **2**: 511. 1825; Torrey & Gray, Fl. N. Am. **1**: 472. 1840 (excl. var. *β*); Nuttall, N. Am. Sylva **2**: 25, *pl. L.* 1853; Gray, Man. Bot. N. U. S. (ed. 1) 130. 1848.

Sorbus riparia Raf. New Fl. **3**: 15. 1836, nomen dubium.

Pyrus sambucifolia sensu Watson & Coulter in Gray, Man. (ed. 6) 164. 1889; Sargent, Silva N. Am. **4**: 81, *pl. clxxiii, clxxiv.* 1892; Dame & Brooks, Handb. Trees New Engl. 113, *pl. lviii.* 1902. Et auct. mult., non Cham. & Schlecht. 1827.

Sorbus sambucifolia sẽnsu Dippel, Handb. Laubholzk. **3**: 368, *f. 191.* 1893. Non Roem. 1847.

Pyrus americana DC. var. *decora* Sargent, Silva N. Am. **14**: 101. 1902.

Sorbus americana Marsh. var. ["Hauptform"] *macrocarpa* Zabel, Handb. Laubholz-Ben. 195. 1903.

Sorbus americana Marsh. var. *decora* Sargent, Man. Trees N. Am. 357, *f. 281.* 1905; (ed. 2) 391, *f. 348.* 1922.

Sorbus scopulina sensu Hough, Handb. Trees U. S. Canada 241, *f. 280–281.* 1907; Britt. in Britt. & Brown, Ill. Fl. N. States (ed. 2) **2**: 287, *f. 2319.* 1913; Schaffner, Field Man. Fl. Ohio 307, 1928, Ohio State Univ. Bull. **36**: 155. 1932. Non Greene 1900.

Pyrus sitchensis sensu Robins. & Fernald in Gray, Manual (ed. 7) 459. 1908; Mathews, Field Book Am. Trees Shrubs 202 (excl. *f. opp. p. 202*). 1915. Non Piper, 1901.

Aucuparia subvestita Nieuwl. Am. Midl. Nat. **4**: 175. 1915.

Pyrus dumosa Fernald, Rhodora **23**: 266. 1921; Pease, Vasc. Pl. Coos Co. N. H. 266. 1924; Wiegand & Eames, Fl. Cayuga Basin 246. 1926. Non *S. dumosa* Greene, 1900.

Sorbus dumosa sensu House, N. Y. State Mus. Bull. **254**: 409. 1924. Non Greene, 1900.

Sorbus americana sitchensis Sudworth, Check List 133. 1927.

Sorbus subvestita sensu Rosendahl & Butters, Trees Shrubs Minn. 195, *f.* 1928; Deam, Shrubs Indiana (ed. 2) 148, *pl. 56.* 1932; Rydberg, Fl. Prairies Plains 438. 1932. Non Greene, 1900.

Pyrus subvestita Farwell, Am. Midl. Nat. **12**: 60, 122. 1930.

A small tree or shrub 6–12 m. tall and 30–40 cm. in diameter, with spreading branches and dark gray bark; winter-buds conical, the outer scales glutinous, reddish brown, dorsally glabrous, the inner scales merely ciliate with whitish or (when old) somewhat fulvous trichomes, or sometimes moderately pilose dorsally; young twigs glabrate; lenticels elliptical, scattered; leaflets 11–15, the lateral ones spreading from the rachis at about a right angle when mature, elliptical or oblong, acute, or abruptly short-acuminate, asymmetrical at the base, 4–8 cm. long, 1.5–2.5 cm. wide, 2–3 times as long as wide, the lowermost pair usually smaller; margins coarsely serrate to the middle or below, the teeth ovate, abruptly mucronate, 30–45 on each leaflet, 3–4 per cm.; upper surface dull, dark green, glabrous at maturity, lower surface paler, completely glabrous or sometimes more or less persistently sparsely pilose, at least along the midvein; terminal leaflet often obovate; petioles and rachises sparsely pilose or entirely glabrous, except for a few glands and often several long trichomes on the upper side of the grooved rachis at the base of the leaflets; inflorescence flat-topped, 8–15 cm. broad; pedicels and peduncles sparsely pilose with whitish trichomes; flowers about 1 cm. in diameter, fragrant; calyx sparsely pilose, the sepals triangular, sharply acute, 1 mm. long, sparingly ciliate, and sometimes with a few minute, dark marginal glands; petals broadly oval, 4 mm. long, somewhat truncate or slightly tapering at the base, about the same length

as the stamens; anthers 0.8 mm. long; styles 3–4, about 2 mm. long, much shorter than the stamens; top of the ovary pubescent; fruit bright scarlet or vermilion red, 8–10 mm. in diameter, subglobose; seeds lanceoloid, light brown, 4.5–5 mm. long, 1.5–2 mm. wide.

TYPE LOCALITY: "in Canada et circa lacum Ontario." (Michaux, l. c.).

RANGE: Newfoundland to Minnesota and southward to Iowa and New York.

NEWFOUNDLAND: Glenwood, *Fernald & Wiegand 5655* (G); Millerton Junction, *Fernald & Wiegand 5654* (G); Bay of Islands, *Fernald & Wiegand 3547* (A), *3548* (G), *Waghorne 41* (G); Bonne Bay, *Fernald & Long 1787* (G); Savage Cove, *Fernald, Pease & Long 28494* (G); St. Johns, *Bishop 369* (G, Can, A); Quarry, *Fernald & Wiegand 5653* (A, Can, NY); Grand Falls, *Fernald & Wiegand 5656* (A); Octagon, July 1902, *Dame* (A); Channel, *Howe & Lang 976* (NY); Whitbourne, August 15, 1894, *Robinson & Schrenk* (NY, Can, US); Port a Port, *Mackenize & Griscom 10323* (US). QUEBEC: Little Metis, July 6, 1906, *Fowler* (US); Sillery, *Adrien 1907* (Can); St. Agathe des Monts, August 26, 1902, *Jack* (A); Lake St. John, August 22, 1895, *Jack* (A); Seven Islands, *C. B. Robinson 877* (NY); St. Pierre Island, *Arsène 276* (NY), *307* (G); Cap à l'Aigle, *Macoun 67144* (NY, Can); Notre Dame du Lac, *Northrop 228* (NY); Ile au Marteau, *Marie-Victorin & Rolland-Germain 18700* (G); Bic, *Rousseau 26342* (A), *Fernald & Collins 1098* (Can); Montmorency Falls, *Macoun 67145* (Can). PRINCE EDWARD ISLAND: Charlottetown, *Fernald & St. John 7576* (A, US); Brackley Point, July 3, 1888, *Macoun 8183* (NY). NEW BRUNSWICK: Dalhousie, June 30, 1905, *Fowler* (US); Campobello Isl., *J. D. Smith, 888, 889* (US); Campbellton, June 4, 1876, *Chalmers* (Can). NOVA SCOTIA: Sandy Cove, *Fernald & Long 21427* (G, Can); St. Paul Isl., *Perry & Roscoe 240* (G, Can); St. John Lake, *Fernald, Bartram & Long 23928* (G); Yarmouth, *Jack 3781* (A); Clementsport, *Jack 3337* (A); Westville, *Jack 3279* (A); Port Bevis, *Fernald & Long 21430* (Can). MAINE: St. Francis, *Fernald 36* (NY, UC, US, NE); Mt. Desert Island, *Stebbins 238* (NE); Schoodic Mt., *Stebbins 435* (NE); Grand Isle, *Fernald 2306* (NE); Island Falls, *Fernald 2305* (NE). NEW HAMPSHIRE: Connecticut Lake, September 1895, *Mrs. A. F. Stevens* (US); White Mountains, June 13, 1879, *Pringle* (A); Mt. Willard, July 18, 1891, *Faxon* (A); Franconia, August 31, 1902, *Jack* (A); Mt. Lafayette, July 1879, *Sargent* (A); Mt. Washington, July 14, 1891, *Faxon* (A);

Moose River, *Pease 13651* (NE); Randolph, *Pease 18084* (NE); Mt. Moosilauke, *Underwood 2190* (NE); Woodstock, *Fernald 11718* (NE). VERMONT: Mt. Mansfield, *Pringle* in 1877 (UC, NY, US), *Greenman 951* (G), *Pringle* in 1879 (A). MASSACHUSETTS: Mt. Greylock, August 4, 1920, *Hoffman* (A). NEW YORK: Smith's Lake, August 22, 1879, *Ward* (US); Clear Lake, August 30, 1892, *Britton* (NY); Chazy Lake, August 22, 1922, *Susan D. McKelvey* (CA, A); Mt. Whiteface, August 8, 1894, *Jack* (A), August 10, 1902, *Rehder* (A); Oswego, *Fernald, Wiegand & Eames 14301* (G); Harris Lake, *Muenscher & Lindsey 3396* (G); Caroline, *Eames, Randolph & Wiegand 12149* (G). ONTARIO: Port Arthur, September 6, 1889, *Britton & Timmerman* (NY); Bruce Peninsula, *Dearness* in 1912 (Can); Whitefish Island, *Macoun 34401* (Can); Moose Factory, July 15, 1904, *Spreadborough* (Can). MICHIGAN: Fields, *Farwell 189* (G); Goose Island, *Gates 15241* (US), *Ehlers 428* (US, G); Hamlin Lake, *Chaney 254* (US, NY, G); Sault Ste. Marie, *McCullough 8261* (US); Cliff, *Hermann 7722* (US, NY); Neguanee, June 1902, *Rydberg* (NY); Vermillion, *Dodge 11* (A); Munising, *Gleason 952* (A). OHIO: Granville, October 25, 1902, *Condit* (UC). INDIANA: Laporte Co., *Orahood 40966* (A); Pokagon State Park, *Deam 54564* (A). IOWA: Fayette, *Gardner 33* (NY). WISCONSIN: Kilbourn, *Fassett 3450* (A, G), *Palmer 28415* (UC, US); Port Wing, *Fassett 10359* (G); Wyoming, *Fassett 12586* (US). MINNESOTA: Big Rice Lake, *Hotchkiss & Jones 451* (G, US); Knife River, June 1893, *Sheldon* (G, US, NY); Duluth, August 20, 1911, *Sargent* (A), *Olga Lakela 1422, 1834* (US, NY), *F. W. Johnson 1102* (US, NY); Itasca Park, *Moyle 390* (G, US, NY, UC); Itaska Lake, *Sandberg 1046* (US); Two Harbors, *Butters & Rosendahl 4470* (NY, G); Pokeguma Lake, *Sandberg 199* (A); Bear Lake, May 25, 1912, *Rosendahl* (A).

This species has a range similar to that of *S. americana,* but it occurs at somewhat higher altitudes and has a more northerly distribution. It is common in montane woods and along riverbanks and lake shores from Newfoundland to the mountains of northern New England, and westward along the shores of the Great Lakes to Minnesota, and southward to Iowa and New York. It is, however, absent from the Coastal Plain. There are several published records of it from as far west as Manitoba, but all these rest on erroneous determinations of *S. aucuparia,* which is frequently cultivated and has a strong tendency to take to the woods, often in places somewhat remote from the nearest human settlement, the seeds carried by birds. *Sorbus decora* is to be distinguished from *S. americana* by its larger and later flowers, the broader,

acute leaflets, and its much larger fruits. In herbarium specimens these often have a glaucescent appearance. It has been confused with several other species, including *S. sambucifolia* (Cham. & Schlecht.) Roemer, which is an entirely distinct low shrub of eastern Asia and the westernmost islands of the Aleutian chain. Some authors have identified the arborescent eastern shrub with one or more of the shrubby species of the Rocky Mountain region, particularly *S. scopulina* and *S. dumosa*. It is, however, quite different from any of those plants. Some other students have misapplied the name *S. subvestita* Greene to this species. It is perfectly clear, however, that Greene's rather meager description does not apply to *S. decora*. Any lingering suspicion of doubt on this point is immediately dispelled by a glance at a photograph or at an isotype of the specimen cited as *S. subvestita*. It is a typical sample of the European *S. aucuparia* L. found growing wild in the woods of Minnesota. Even the name *subvestita* is not appropriate for *S. decora*, since mature leaflets of the majority of the specimens of this species are almost glabrous except for some sparse pubescence along the lower part of the midvein on the lower or abaxial surface of the leaflet. Old leaves usually are completely glabrous throughout.

The name *S. riparia* Raf. is here rejected as a nomen dubium. Although it is possible that Rafinesque actually had seen a tree of the species we now name *S. decora*, his description is vague and uncertain and it seems undesirable to attempt to revive a doubtful name that has been dormant for over a century, and to try to establish it in preference to one based on an adequate foundation.

I have seen no conclusive evidence of hybridization between *S. decora* and any other species of *Sorbus*, although such hybrids may possibly occur. There are, however, specimens that have been described as hybrids between this species and members of the closely related genus *Aronia*. These were said originally by the describer, Bro. Louis Arsène, to represent a natural hybrid between *S. americana* Marsh. and *Aronia atropurpurea* Britt. [*A. prunifolia* (Marsh.) Rehd.], but later he identified the Sorbus-parent as the plant we now call *S. decora*. Following Schneider, and Rehder, and using a binary name instead of a formula for these plants, a new combination becomes necessary, and the synonymy is as follows:

× **Sorbaronia Arsenii** (Britt.) n. comb. *Sorbus decora* (Sarg.) Schneid. × *Aronia prunifolia* (Marsh.) Rehd.

Sorbus Arsenii Britt. ex Arsène, Rep. Bot. Exch. Club Brit. Isles **7**: 961. 1926.

Pyrus Arsenii Arsène, Rhodora **29**: 177. 1927.

Shrub 1–2.5 m. tall; leaves 2–7 cm. long, pinnate below, cleft or lobed above, the terminal segment largest; inflorescence resembling that of *Aronia,* the branches ascending.

Many of the leaves of this bigeneric hybrid are pinnatifid, or pinnate with 1–3 pairs of dentate or lobed, acute, mostly glabrous leaflets (or segments). The following specimens have been examined: Miquelon Isl., July 20, 1902, *Arsène* (G, NY), also July 25, 1902, *Arsène 308* (G, NY), *LeHors 292a* (G); Ethel Lake, St. Paul Isl., Nova Scotia, July 22, 1929, *Perry & Roscoe 242* (G).

6a. **Sorbus decora** var. **groenlandica** (C. Schneid.) n. comb.

Pyrus Aucuparia sensu E. Mey., Pl. Labrador. 81. 1830, ex parte. Non L. 1753.

Sorbus americana Marsh. var. *groenlandica* C. Schneid., Bull. Herb. Boiss. II. **6**: 314. 1906.

Shrub 1–3 m. tall; winter-buds somewhat glutinous, the outer scales reddish brown, nearly glabrous dorsally, the inner scales whitish-pilose; leaflets (11–) 13–17, oblong, sharply acute, 2–3 times as long as wide, sharply and somewhat irregularly simply or doubly serrate to below the middle; the upper surface dark green and glabrous at maturity, the lower surface pale green, glabrous or often sparsely pilose, at least along the midvein toward the base of the leaflet; terminal leaflet elliptical, petiolulate, the lateral ones nearly sessile; inflorescence 5–10 cm. broad; pedicels and peduncles whitish-pilose to glabrous; flowers 5–8 mm. broad; hypanthium glabrous or nearly so; sepals triangular, acute, 1.5–2 mm. long in anthesis, glabrous on the back, sparsely ciliolate to glabrous on the margins; petals about as long as the stamens, orbicular, 3–4 mm. long, the base truncate; styles 3, shorter than the stamens, 1.5 mm. long; fruits ellipsoid or subglobose, 5–7 mm. long, 5 mm. thick (in herbarium specimens), red, glossy or slightly glaucous; seeds lanceoloid, 4 mm. long, 2 mm. wide, brown.

TYPE LOCALITY: South Greenland.

RANGE: South Greenland and Labrador.

GREENLAND: Neria, July 26, 1923, *J. Eugenius* (G), July 24, 1926 (G), August 6, 1928 (Can), September 24, 1928 (Can), June 29, 1934 (Can); Tasermint, September 4, 1889, *Hartz* (Can); Kranifjord, August 18, 1922, *M. P. & A. E. Porsild* (G, Can); Kangikitsup Quinga, July 4, 1925, *M. P. & A. E. Porsild* (G, Can). LABRADOR: Deepwater Creek, September 17, 1892, *Waghorne* (Can); Battle Harbour, *Hitchcock 23854* (US), August 9, 1911, *Williamson* (NY); Hamilton River, *A. P. Low 4989* (Can); Cartwright, July 1928, *Malte* (Can); Georges

River, *Spreadborough 16312* (Can); Rigolet, September 24, 1926, *J. D. Soper* (Can); Hopedale, *Potter & Brierly 3087* (G), *Bishop 367* (G, A, Can); Windy Tickle, *Bishop 366* (G, A, Can); Salmon Bight, *A. E. Porsild 44* (Can, US); Turnavik, *A. E. Porsild 136* (Can); Assizes Island, *Potter & Brierly 3086* (G); Anatolak, *Sewall 501* (G, US); Aillek, *Sornborger 123* (NY, US); Esquimeaux River, July 27, 1882, *Allen* (G).

This plant is restricted to coastal Labrador and southern Greenland. It has been reported as *S. americana* and as *S. decora,* but it is somewhat different from each of those plants. It is said by Schneider (l. c.) to be more closely related to the former species ("Aehnelt in Serratur etc. der *americana* mehr als der *decora,* doch sichere Verwandtschaft fraglich"). However, the leaves, including the shape and pubescence of the leaflets, indicate a closer affinity with *S. decora;* likewise the structure of the flowers, the shape of the petals, and the relative length of the petals and stamens, and the size of the anthers, show a closer connection with the latter than with the former species. According to various published notes, and dates on herbarium sheets, *S. groenlandica* flowers during July and August. M. P. Porsild (Meddel. om Groenl. **77**: 18, 1930) reports it as occurring in Greenland "in all Alnus and Betula thickets visited but nowhere dominant." It occurs between 60° and 64° N. latitude in Greenland. In Labrador it grows at least as far north as latitude 56° N.

7. **Sorbus cascadensis** G. N. Jones, Univ. Washington Publ. Biol. **7**: 174. 1938. Plate 227

Sorbus sambucifolia sensu Howell, Fl. NW. Am. 164. 1898. Non Roemer, 1847.

Pyrus sitchensis Piper, Mazama **2**: 107. 1901, Contr. U. S. Nat. Herb. **11**: 347. 1906, ex parte; Henry, Fl. S. Brit. Col. 183. 1915; Gilkey, Handb. NW. Flow. Pl. 148. 1936.

Sorbus sitchensis sensu Benson, Contr. Dudley Herb. Stanford Univ. **2**: 101. 1930. Non Roemer, 1847.

Sorbus dumosa sensu G. N. Jones, Univ. Washington Publ. Biol. **5**: 180. 1936. Non Greene, 1900.

Shrub 2–5 m. tall, forming clumps, the branches suberect, with smooth, gray bark; winter-buds and young twigs pubescent; lenticels numerous, roundish; leaves odd-pinnate, 15–20 cm. long; petioles and rachises sparsely pilose to completely glabrous; leaflets 9–11, nearly equal, oval, abruptly acute at the apex, obliquely acute to somewhat rounded at the base, glabrous on both surfaces, dark and somewhat glossy green above, pale green beneath, coarsely and sharply serrate from the apex to below the middle, 5–7 cm. long, 2–3 cm. wide; terminal

leaflet obovate, abruptly apiculate-acute; inflorescence 7–12 cm. broad, 30–60-flowered, somewhat convex, the pedicels and peduncles sparsely pilose with short, white trichomes; flowers white, fragrant, 8–10 mm. in diameter; calyx-tube campanulate, 3 mm. long, glabrous to sparsely pilose; sepals triangular, acute, ciliate, 1.5 mm. long; petals orbicular, 5–6 mm. long, longer than the stamens; styles usually 4, 2 mm. long, much shorter than the stamens; anthers 1 mm. long; fruit globose, scarlet, 8–10 mm. in diameter; seeds ovoid, flattened, dark brown, 4 mm. long, 2 mm. wide.

TYPE LOCALITY: Mount Rainier, Washington.

RANGE: Southern British Columbia, southward in the Olympic and Cascade mountains to northern California.

BRITISH COLUMBIA: Sproat, *Macoun 8217* (Can); Chilliwack Lake, *Spreadborough 79775* (NY); near Shawnigan Lake, *Canby, Sargent & Muir 66* (US, G). WASHINGTON: Mt. Angeles, July 6, 1921, *Taylor* (CA); Dosewallips River, July 30, 1921, *Taylor* (CA); Skagit Pass, August 24, 1892, *Lake & Hull* (NY); Copper Mt., *Gorman 726* (US); Billygoat Pass, *Eggleston 13525* (US); Stehekin, *Griffiths & Cotton 204* (NY, US); Chiwaukum Creek, *Eggleston 13537* (US); Ashford, *Allen* (A); Mt. Rainier, *Jones 9924* (G, TYPE), *Piper 1990* (G, US, A); Bear Prairie, Mt. Rainier, *Allen 291* in part (US, G, NY, UC); Fort Colville to the Rocky Mts., *Lyall* in 1861 (G); Cascade Mts., lat. 49° *Lyall* in 1859 (G); Mt. St. Helens, *Coville 791* (US), *Walpole 25* (US); Cascades, *Kellogg & Harford 227* (NY). OREGON: Cascade Mts. August 4, 1880, *Engelmann & Sargent* (A); Mt. Hood, *Benson 2517* (NY, UC, US), *Henderson 890* (G), *Coville 891* (US); Lost Lake, *Henderson 889* (G); Deadner Mt., near Weiner, *Walpole 85* (US); Crater Lake, *Heller 12950* (NY, US, G, CA), *Henderson 1764, 1533* (G), *Thompson 12298* (NY); Klamath Lake, August 29, 1896, *Sargent* (A); Ashland, August 27, 1896, *Sargent* (A). CALIFORNIA: Hilt, October 1912, *L. E. Smith* (CA); Hatchet Creek Mts., May 24, 1894, *Baker & Nutting* (UC); Butte Creek, *Heller 14706* (NY, US); Sisson, *Eastwood 2083* (A, US, CA); Salmon Mts., *Eastwood & Howell 5039* (A, CA); Castle Lake, *Eastwood 10761* (A, CA), July 27, 1911, *Condit* (CA); Lake City Canyon, *Austin & Bruce 2356* (NY); Trinity Summit, *Tracy 5292* (UC); Taylor Creek, *Baker 475* (UC); Colby, *Austin 751* (US); Warner Mts., *Griffiths & Hunter 450* (US).

This species is closely related to *S. californica* Greene. It is, however, a more robust shrub with larger, abruptly acute, oval leaflets; the pedicels are white-pilose, and the petals larger. It occurs from northern

California to the Cascade and Olympic Mountains of Washington, and adjacent British Columbia. It has been erroneously ascribed to several other, distantly related species, particularly to S. *sambucifolia* (Cham. & Schlecht.) Roemer, and *S. sitchensis* Roemer. In 1901 Piper pointed out that it is not conspecific with the Asiatic *S. sambucifolia* (at that time not known to occur in North America); instead, he stated that it is identical with the Alaskan plant described by Roemer as *S. sitchensis.* Since that time most botanists have been more or less content to follow his lead, and no less than four totally different species have been called "*sitchensis.*" Recently, however, the identity of Piper's *Pyrus sitchensis* with Roemer's *Sorbus sitchensis* has been questioned, and the present writer (Univ. Wash. Publ. Biol. **5**: 180. 1936) concluding that the shrub of the Cascade and Olympic Mountains could not be the latter species, assumed on the basis of wholly inadequate evidence, that it is conspecific with *S. dumosa* Greene of Arizona. This is, however, not correct. Neither is it the *Pyrus dumosa* of Fernald, which turns out to be the quite distinct arborescent *S. decora* of eastern North America.

In Washington and Oregon *Sorbus cascadensis* has much the same distribution as *S. occidentalis,* but the two species seldom grow together in the same habitat. It is almost entirely a species of the Canadian zone, while the latter is definitely Hudsonian. Its usual altitudinal level in the northern half of its range is about three thousand feet, but it ascends to six thousand feet in the vicinity of Crater Lake in the Cascade Mountains of southern Oregon. The two species are entirely distinct phylogenetically, and it is difficult to see how botanists ever could have confused them. *Sorbus occidentalis* has a near affinity with *S. sitchensis,* as indicated by the glaucescent fruits, shape and size of the inflorescence, ferrugineous pubescence, the shape of the leaflets, and the shape of the petals and the relative length of petals and stamens, while *S. cascadensis* is connected with *S. scopulina* of the Rocky Mountains through *S. californica.*

As noted above, *S. cascadensis* frequently has been confused with *S. sitchensis.* That species is quite distinct, however, in its glaucescent fruits, dull, usually more obtuse and more coarsely serrate leaflets, the teeth usually fewer, the smaller inflorescence, and the pubescence of the pedicels and bracts tawny or rufous; in addition it has a more northerly and easterly range.

In many respects *S. cascadensis* closely resembles, and is doubtless nearly related to, *S. scopulina* which occurs on the eastern slope of the Cascade Mountains and ranges eastward to the Black Hills of South Dakota. The shrub of the region west of the summit of the Cascade

Mountains differs in its usually fewer flowers and fruits, in its shorter stamens, more convex inflorescence, and its broader, less glossy, usually more coarsely serrate leaflets. These are oblong-oval, abruptly acute (instead of linear-lanceolate or oblong-lanceolate and acuminate as in *S. scopulina*), and at maturity are spreading at right angles from the rachis in the manner of those of the eastern American *S. decora*.

8. **Sorbus californica** Greene, Pittonia **4**: 131. 1900; Schneider, Ill. Handb. Laubholzk. **1**: 671, *f. 366, i-k*. 1906.

Pyrus sambucifolia sensu Brewer & Watson, Bot. Calif. **1**: 189. 1876. Non Cham. & Schlecht. 1827.

Sorbus occidentalis sensu Greene, Fl. Franciscana 54. 1891; Coville, Contr. U. S. Nat. Herb. **4**: 97. 1893. Non Greene 1900.

Sorbus sitchensis sensu Hedlund, Svenska Vet.-Akad. Handl. **35**: 40. *f. 4*. 1901, ex parte. Non Roem. 1847.

Pyrus occidentalis sensu H. M. & C. C. Hall, Yosemite Flora 124. 1912. Non Wats. 1888.

Pyrus sitchensis Piper var. *californica* Smiley, Univ. Calif. Publ. Bot. **9**: 233. 1921.

Pyrus sitchensis sensu Jepson, Man. Fl. Calif. 508, *f. 506*. 1925, Fl. Calif. **2**: 230. 1936. Non Piper 1901.

A many-stemmed shrub 1–2 m. tall; winter-buds glutinous, the inner scales sparsely ferrugineous-ciliate; young twigs glabrous, the lenticels inconspicuous, oval; leaflets 7–9 or –11, oblong-oval, obtuse or acutish, sharply and coarsely singly or often doubly serrate to below the middle, 1–2 cm. wide, 2–4 cm. long, glabrous on both sides, somewhat glossy above, paler beneath, the terminal leaflet obovate; petioles and rachises glabrous; inflorescence few-flowered, 4–10 cm. broad, somewhat convex on top; pedicels and peduncles glabrous; calyx glabrous, campanulate, 3 mm. long, the sepals ciliolate, triangular, acute, 2 mm. long; petals orbicular, 3–4 mm. long; stamens shorter than the petals, longer than the styles; anthers 1 mm. long; styles four 1.5–2 mm. long; ovary pubescent on top; fruit scarlet or coral-red, ellipsoid or somewhat pyriform, not glaucescent, 7–10 mm. in diameter; seeds oval, slightly flattened, light brown, acute at one end, 4 mm. long, 2 mm. wide.

TYPE LOCALITY: Sierra Nevada, California.

RANGE: California and western Nevada.

CALIFORNIA: Big Meadows, August 27, 1904, *Rehder* (A), *Butler 282* (UC); Marble Mt., *Chandler 1633* (UC); Medicine Lake, *Baker 471* (UC); Union Lake, *Hall 8621* (US); Trinity Summit, *Davy & Blasdale 5835* (UC); Lasseck Peak, *Goddard 694* (UC); Lassen Butte region, *Eastwood 1760* (CA); Mt. Lassen, Sept. 6, 1931, *Jussel* (CA); Long Lake, *Bacigalupi 1655* (A); Soapstone Ridge, *Heller 12059* (CA,

G, A); Feather River Region, August 2, 1921, *Head* (CA); Long Valley, *Eastwood 14638* (CA, A); Mineral King, *Coville & Funston 1425* (US), July 28, 1892, *Brandegee* (A, UC); Mt. Elwell, *Hall 9340* (UC, US); Jamison Lake, *Rose 32624* (CA); Greenville, October 20, 1919, *Mrs. J. Clemens* (CA); N. Fork Stanilaus River, June 28, 1930, *Jussel* (CA); Crystal Lake, *Mary Strong Clemens* in 1920 (CA); Lake Lucille trail, *Eastwood 1031* (A, CA); toward Summit, July 1897, *Sonne* (A); near Summit, *Heller 7026* (A, US, G, UC, NY), July 1876, *Edwards* (NY), *Heller 9835* (A, G, NY), July 9, 1870, *Kellogg* (CA), *Brandegee* (CA); Cisco, *Walker 1445* (UC); Ebbet's Pass to Summit, *Brewer 2091* (SYNTYPE UC, US); Deer Park, *Eastwood 314* (CA); Grass Lake, July 23, 1923, *Blasdale* (UC); Emerald Bay, Lake Tahoe, September 22, 1925, *Louise Bartholomew* (CA); Heather Lake, *Wolf 2406* (UC); Rubicon Springs, August 1924, *Mrs. Engel* (CA); Pyramid Peak, *Smiley 76* (G); Mt. Tahoe, *Abrams 4814* (G, NY); summit of Sierra Nevada, *Bolander* in 1873 (US); Sierra Nevada Mts., *Lemmon* in 1875 (US); Marble Fork, *G. B. Grant 1518* (US); Ralston Peak, *Smiley 416* (G); Huntingdon Lake, July 1926, *Alice Griffin* (CA); Vidette Lake, July 1916, *Mrs. M. L. Campbell* (CA); without locality, *Bolander 2091* (UC); Glen Alpine, *J. T. Howell 1317* (CA), September 1904, *Catherine Chandler* (UC), *Abrams 12758* (NY, G, UC), July 1, 1898, *W. W. Price* (UC); Tioga Pass, September 15, 1923, *Mason* (UC); Gaylor Lakes, August 9, 1923, *Mason* (UC); Tuolumne region, July 25, 1889, *Chestnut & Drew* (UC); Dog Lake, *Smiley 837* (G); Pine Ridge, *Hall & Chandler 333* (UC); Tamarack Beach Camp, July 1914, *Wieslander* (UC); Shut Eye Pass, *Abrams 4943* (A, G, NY); Shuteye Mt., *Murdoch 2520* (NY); Isberg trail, *Zentmyer 2002* (UC); between Lake Tenaya and Cathedral Lake, *Eastwood 444* (CA); Buck Canyon, Kaweah River region, *Hopping 54* (UC); Emerald Lake, Sequoia Nat. Park, July 25, 1932, *Darland* (UC); Farewell Gap, Tulare Co., *Culbertson 4527* (G, CA); Fallen Leaf Lake, *Wolf 1715* (CA). NEVADA: Washoe Co., *Kennedy 1461* (NY, UC, US); Snow Valley, *Baker 1281* (NY, UC, CA, US, A); Slide Mt., *Nordstrom 979* (UC), *Heller 10929* (NY, UC, US, A); Donner Lake, July 10, 1902, *Diehl* (CA, A).

Sorbus californica is restricted to California and western Nevada. In California it grows along streams or on moist steep slopes in the Canadian and Hudsonian zones of the Sierra Nevada from Tulare County to Modoc County at altitudes of 5000–10,000 feet, and in the North Coast Ranges from Humboldt County to Siskiyou County. From *S. scopulina*, which occurs in California only along the eastern border

of the state from Modoc County to Tulare County, it is to be distinguished by its fewer, oval, obtusish, less finely serrate leaflets, the sparsely ferrugineous-ciliate inner scales of the winter-buds, the fewer-flowered, round-topped inflorescence with glabrous peduncles, the shorter styles and the oval, slightly broader seeds. *Sorbus cascadensis* extends southward as far as the northern part of the state of California, and is found chiefly in Siskiyou, Humboldt, Modoc, and Butte counties. It is a more robust shrub with usually 11, larger, more coarsely serrate, abruptly acute leaflets, pilose peduncles, larger inflorescence, longer petals, and larger, more pubescent winter-buds.

9. **Sorbus sitchensis** Roemer, Syn. Mon. **3:** 139. 1847; Hedlund, Svenska Vet.-Akad. Handl. **35:** 41. 1901, ex parte; Standley, Contr. U. S. Nat. Herb. **22:** 366. 1921; Rehder, Man. Cult. Trees Shrubs 378. 1927; Raup, Contr. Arnold Arb. **6:** 173. 1934.

Pyrus sambucifolia sensu Bong. Mém. Acad. St. Pétersb. VI, **2:** 134. 1832 (repr. Veg. Sitcha 16); Henshaw, Mt. Wild Fls. N. Am. 336, *pl. 91*. 1906. Non Cham. & Schlecht. 1827.

Sorbus occidentalis sensu Coville, Contr. U. S. Nat. Herb. **3:** 339. 1895; Rydberg, Fl. Rocky Mts. 448, 1917; Kirkwood, Rocky Mt. Trees Shrubs 199. 1930. Non Greene, 1900.

Sorbus Tilingii Gandoger, Bull. Soc. Bot. France **65:** 25. 1918, ex parte.

A shrub 1–4 m. tall; winter-buds ellipsoid, rufous pubescent; young twigs rufous puberulent; lenticels linear or oval; stipules linear-lanceolate, 6–9 mm. long, rufous pubescent; leaflets 9–11, oval or oblong, 4–7 cm. long, 1.5–3 cm. wide; apex obtuse or acutish; margins rather coarsely and sharply serrate to the middle or below; teeth usually 16–40 on each leaflet; upper surface dull, glabrous; lower surface somewhat paler, glabrous at maturity, or pubescent along the midvein; petioles and rachises finely pubescent or pilose, glabrate in age; inflorescence round-topped, 5–9 cm. broad, 40–60-flowered; pedicels and peduncles rufous pubescent to nearly glabrous; flowers 6–9 mm. broad, fragrant; calyx 3–3.5 mm. long, glabrous on the back, campanulate; sepals ciliolate; petals oval, 5 mm. long, longer than the stamens; styles 1.5–2 mm. long; top of the ovary pubescent; fruit subglobose to ellipsoid, red, becoming orange and finally purplish, glaucescent, 8–10 mm. in diameter; seeds dull brown, ellipsoid or ovoid, 3–4 mm. long, 2–2.5 mm. wide.

TYPE LOCALITY: "In insula Sitcha ad oram occidentalem Americae borealis." Collected by Mertens.

RANGE: Alaska and Yukon through British Columbia to northwestern Montana and adjacent Idaho.

ALASKA: Port Etches, *Macoun 19930* (Can); McDonald Lake,

Burcham 107 (US); north of Mt. St. Elias, *D. W. Eaton 2;* Seldovia Bay, July 12, 1913, *Griggs* (US); Halibut Cove, *Coville & Kearney 2433* (US); Yes Bay, *Gorman* in 1894 (UC), *Gorman 41* (NY, US); Juneau, *Walpole 1234* (US), *Jepson 477* (US); Yakutat Bay, *Coville & Kearney 1157* (US); Muir Inlet, *Coville & Kearney 690* (US); Amalik Bay, *Henning 554* (US); between Skagway and White Pass, *Coville & Kearney 502* (US); Wrangel, *Coville & Kearney 445* (US), *Evans 64* (US); Sitka, *Coville & Kearney 875, 915* (US), *Anderson 118* (US), *Canby, Sargent & Muir 64* (UC); New Metlakatla, September 2, 1897, *Sargent* (A); Disenchantment Bay, *Funston 92* (US, UC, Can); Ketchikan, July 6, 1909, *Kellogg* (US); Heather Island, *Coville & Kearney 1348* (US); Loring, *Chamberlain 71,* (US); Prince William Sound, *Edmund Heller 45* (UC), *Evans 294* (US); Orca, *Coville & Kearney 1319* (US); Kukak, July 1899, *Kincaid* (A); Nakuk Lake, July 17, 1919, *A. E. Miller* (US); Alaska Mts., *Bayne Beauchamp Exped. 30* (UC). British Columbia: Bennett, August 25, 1899, *Williams* (US); Lake Bennett, *Dawson 8210* (Can); Glacier, *Canby, Sargent & Muir 63* (G, US), July 29, 1909, *Rusby* (NY), August 14, 1904, *Jack* (A), August 13, 1904, *Rehder* (A), August 1897, *Sargent* (A), July 30, 1916, *Hunnewell* (G); Cumshiwa Inlet, Queen Charlotte Islands, *Osgood* in 1900 (US); Dawson Harbour, June 24, 1897, *Newcombe* (Can); Skagit River, *Macoun 69919* (Can); Chilliwack Valley, *Macoun 34379, 34381* (Can, US, G, NY), *34380* (US, G, NY, Can); Great Northern Mountain, August 2, 1904, *Scheuber* (US); Asulkan Valley, August 14, 1904, *Rehder* (A); Talliser, August 13, 1904, *Rehder* (A); Mt. Selwyn, *Raup & Abbe 4043, 4070* (A, Can); White Pass, (Yukon) *Eastwood 904* (A). Alberta: Whistlers Mt. Jasper Park, *Jack 2701* (A); Lake Louise, *Macoun 65116* (NY, Can, G), July 24, 1916, *Hunnewell* (G). Montana: Lake McDonald, *Umbach 328* (NY); MacDougal Peak, *MacDougal 815* (NY, US, A); Essex, *Williams 1069* (NY, US, G); Mt. Silcox, *Butler 5097* (NY); Snyder Lake, *Standley 17961* (US); Grinnell Lake, *Standley 15226* (US), *Jack 2107* (A); Grinnell Glacier, August 31, 1921, *McKelvey* (A); Sperry Glacier, *Standley 18082* (US); Granite Park Chalets, *Standley 16131* (US); Gunsight Pass, *Standley 18210* (US); Iceberg Lake, *Standley 15381* (US); Glacier National Park, *Hitchcock 11945* (US); Gunsight Lake, *Jack 2245* (A). Idaho: Divide between St. Joe and Clearwater River, *Leiberg 1248* (A, NY, G, US); Bear Creek Canyon, *Leiberg 2967* (US); Upper Priest River, *Epling 7931* (US); Weissners Peak, *Leiberg 1668* (US).

Although this is one of the most distinctive species in the genus, and

bears no close resemblance to any other except *S. occidentalis,* it has been persistently misunderstood, probably on account of inadequate herbarium material for study, and the rather unsatisfactory original description by Roemer. Hedlund, the monographer of *Sorbus,* completely misinterpreted it, and had it confused, not only with *S. occidentalis,* but with *S. californica* as well. As an example of his almost complete lack of knowledge of this plant, he says that it "scheint der S. americana am nächsten zu stehen." Schneider, although recognizing the distinctness of *S. californica* and *S. occidentalis,* reduces the latter to a synonym of *S. pumila* (*S. sitchensis*). Piper was even further from the mark when he mistook the shrub of the Cascade Mountains, herein called *S. cascadensis,* for *S. sitchensis,* which differs in its ellipsoid, dull, glaucescent fruits, smaller, convex inflorescence, ferrugineous pubescence, shape and serration of the smaller, dull, usually obtusish leaflets, and the wholly separate geographical distribution. *Sorbus cascadensis* has globose, scarlet, glossy fruits in denser, flat-topped clusters, the acute, glossy, somewhat larger leaflets serrate almost to the base, and the sparse pubescence of whitish trichomes. Rydberg, in his usually critical *Flora of the Rocky Mountains* (1917), came nearer than any of his predecessors to an understanding of *S. sitchensis,* but even he called it *S. occidentalis,* giving as a possible synonym: "(?) *S. sitchensis* Roem." Standley (Flora of Glacier National Park, 1921) appears to have been the first modern botanist to interpret correctly this species, which ranges from southern Alaska, across British Columbia, and southward to northern Montana and adjacent Idaho. As far as is known, it is the only species of mountain-ash occurring at Sitka, Alaska, the type locality.

Sorbus sitchensis is most closely related to *S. occidentalis,* from which it may be readily distinguished by the thicker, coarser, somewhat coriaceous, sometimes acutish leaflets that are serrate to the middle or below, and the glabrous or nearly glabrous rachises. In addition, the inflorescence is more densely flowered, and the styles are fewer (3–4) and shorter (1.5–2 mm. long).

Occasional specimens from Glacier National Park, Montana (*Standley 15747, 17566, 18452,* US), have acute, less coarsely serrate leaflets and larger inflorescences, suggesting a hybrid origin with *S. scopulina,* which is a common shrub in that region.

In 1918, M. Gandoger proposed *Sorbus Tilingii,* basing it upon one specimen from Sitka, Alaska, collected by Tiling, and four other specimens from various parts of the United States, as well as three from northeastern Asia. Through the courtesy of M. Douin of the Univer-

sité de Lyon, and the co-operation of Dr. Leon Croizat of the Arnold Arboretum, I have been able to examine Gandoger's herbarium material of this proposed species. The holotype turns out to be a topotype and a typical specimen of *S. sitchensis*. The four North American paratypes consist of two sheets of *S. scopulina* (Montana: *Williams;* Colorado: *Crandall*), one of *S. decora* (Vermont: *Pringle*); and one of the European *S. aucuparia* (Illinois: *Bross*) that has become naturalized in that State. The three Asiatic specimens are labelled *S. sambucifolia;* they belong, however, to some other oriental species, possibly *S. discolor* Maxim. Thus it is plain that Gandoger has not described a new species, but has merely applied a new name to a group of miscellaneous herbarium specimens belonging to no less than five different species, of which four are already well known North American plants. The name *S. Tilingii* becomes accordingly a synonym of *S. sitchensis*.

Bongard (l. c.) reports from Sitka a small-leaved variety as follows: "Huic adjungimus varietatem *microphyllam,* foliis quam in praecedente triplo minoribus insignem, quam autem, floribus fructibusque deficientibus definire nequimus." The significance of this reference has not been ascertained. As previously noted, the only species of *Sorbus* known to occur at Sitka is *S. sitchensis* Roemer.

10. **Sorbus occidentalis** (Wats.) Greene, Pittonia **4**: 131. 1900; Howell, Fl. NW. Am. 164. 1898; Benson, Contr. Dudley Herb. Stanford Univ. **2**: 102. 1930; Jones, Univ. Washington Publ. Biol. **5**: 180. 1936, op. cit. **7**: 108. 1938.

Sorbus pumilus Raf. Med. Fl. **2**: 265. 1830, *nomen subnudum;* Hedlund, Svenska Vet.-Akad. Handl. **35**: 39. 1901; Schneider, Ill. Handb. Laubholzk. **1**: 669, *f. 366 g-h.* 1906, excl. syn. *S. sitchensis;* Rehder, Man. Cult. Trees Shrubs 378. 1927.

Sorbus humifusa Wats. Bibliogr. Index 290. 1878 (error in transcription).

Pyrus occidentalis Wats. Proc. Am. Acad. **23**: 263. 1888; Piper, Contr. U. S. Nat. Herb. **11**: 347. 1906; Henry, Fl. S. Brit. Col. 183. 1915; Gilkey, Handb. NW. Flow. Pl. 148. 1936.

Sorbus sambucifolia Roemer var. *Grayi* Wenzig, Bot. Centralbl. **35**: 342. 1888.

Pyrus sambucifolia var. *pumila* Sargent, Silva N. Am. **4**: 82. 1892.

Sorbus sambucifolia Roemer var. *pumila* Koehne, Deutsche Dendrol. 247. 1893.

Shrubs 1–3 m. tall, with gray bark; winter-buds ellipsoid, 5–7 mm. long, rufous pubescent; young twigs finely pubescent or puberulent; lenticels numerous, oblong; leaflets 7–11, thin, perfectly glabrous at maturity, oblong to oval (rarely somewhat lanceolate), 2–6 cm. long,

8–25 mm. wide, acutish at the base, the apex always rounded or obtuse, or even truncate, frequently minutely apiculate by the shortly excurrent midvein; margins entire except at or near the apex, or sometimes with a few teeth toward the middle; teeth 0–15, usually 6–12, obliquely lanceolate, acuminate, incurved, 3–4 per cm.; upper surface of leaflets dull, pale bluish-green, lower surface paler, reticulate; terminal leaflet oval; petioles and rachises finely pubescent, less commonly nearly glabrous; inflorescence 3–6 cm. broad, compact, convex on top, 15–40-flowered, the flowers about 1 cm. in diameter; pedicels, peduncles, and bracts more or less rufous pubescent to nearly glabrous, the bracts tardily deciduous, linear, acute, 2–10 mm. long; calyx campanulate, glabrous, 3–4 mm. long, the sepals 1–1.5 mm. long, ciliate; petals oval, very shortly clawed, 3–4 mm. long, often slightly pubescent on the upper surface near the base; stamens much shorter than the petals; anthers 0.5–0.7 mm. long; styles 5, about 3 mm. long; top of the ovary pubescent; fruit red, glaucescent, ellipsoid, 6–8 mm. in diameter, 7–10 mm. long; seeds castaneous, oval or ovoid, acute at the base, slightly flattened and oblique, 3.5 mm. long, 2.5 mm. wide when mature.

TYPE LOCALITY: Cascade Mountains, 49° N. latitude. Collected by David Lyall.

RANGE: Southwestern British Columbia to Oregon in the Cascade Mountains and the Coast Range, at altitudes of 4000 to 7500 feet, and one known station in Siskiyou County, California. Chiefly Hudsonian.

BRITISH COLUMBIA: Skagit Valley, *Macoun 69916, 69917, 69918* (NY, Can); Chilliwack Valley, *Macoun 34373, 34374, 34377, 34378,* (US, Can, G, NY), *34375, 34376* (US, Can). WASHINGTON: Cascade Mountains, lat. 49°, *Lyall* in 1859, TYPE (G); Olympic Mountains, August 18, 1896, *Sargent* (A), *Piper 423* (A), *Elmer 2509* (A, US, NY); Mt. Baldy, *Lamb 1365* (A, NY), *Conard 304* (US, G, NY); Bridge Creek, *Elmer 663* (NY, US, A); Lake Chelan, *Dr. Kuhn* in 1856 (NY); Yakima region, *Brandegee* in 1882 (UC); Mt. Shuksan, *Benson 2413* (NY, US); Mt. Baker, *Gorman 2514* (UC), *Hitchcock 12274* (US); Welcome Pass, *Thompson 8071* (G, UC); Skagit Pass, August 1892, *Lake & Hull* (NY); Stevens Pass, *Benson 2352* (NY, US, UC), *Sandberg & Leiberg 750* (A, G, CA, US, UC, NY), *Whited 1429* (US); Horseshoe Basin, *Gorman 795* (US); Mt. Dickerman, *Thompson 8876* (US, A); headwaters of the Stehekin River, October 5, 1904, *Sudworth* (US); Tye, *Otis 709* (CA); Mount Rainier, *Allen 125* (NY, UC, US), *125a* (NY, G, UC, US, A), *Benson 2324* (US, UC, NY), July 1897, *Flett* (US), *Mrs. Bailey Willis* in 1883 (NY), August

20, 1904, *Jack* (A), same date, *Rehder* (A), August 8, 1896, *Sargent* (A), *Grant* in 1925 (CA), *M. Baker 675b* (CA), *Eastwood 1060* (CA), *C. H. Merriam* in 1897 (US), *Piper 1988* (A, US), *H. E. & S. T. Parks 21008* (US, UC), *21054* (G, UC), *Esther Perry*, August 1931 (UC), *Munz 9933* (G), *G. N. Jones 6099, 10264, 10285* (G); Mt. St. Helens, *Walpole 24* (US), *Coville 789, 790, 812* (US), *Thompson 12667* (NY, A); Mt. Adams, August 7, 1894, *Lloyd* (NY); Skamania Co., *Suksdorf* in 1886 (G). OREGON: Mount Hood, August 20, 1896, *Sargent* (A), *C. H. Merriam* in 1896 (US), *Langille 115* (US), *Walpole 96* (US), *Applegate 2874, 2809* (US), *Thompson 4923* (US), *Mrs. E. C. Van Dyke* in 1928 (CA), *Benson 2518* (NY, US), July 22, 1894, *F. E. Lloyd* (NY), *Thomas Howell 1497* (US, UC, NY); Marion Lake, *Coville & Applegate 1155* (US); Three Sisters, *Coville & Applegate 558* (A, US), *Gorman 1715* (US); Mt. Jefferson, *Peck 9177* (NY), *Coville & Applegate 1178* (US), *J. C. Nelson 2876* (G); Metolius trail, near Ann Lake, *Coville & Applegate 1161* (US).

This very distinctive shrub is most closely related to *S. sitchensis* Roem., and frequently has been mistaken for that species. It is attributed to the Rocky Mountain area by Rydberg but it does not extend that far eastward. The Rocky Mountain material so described and identified is *S. sitchensis*. The leaflets of *S. occidentalis* are different from those of any other North American species in being entire for most of their length. Occasionally they are entire throughout. The teeth are seldom more than about fifteen, the usual number ranging from six to twelve. They are confined to near the apex of the obtuse, or sometimes truncate, leaflet. Rarely does the serration extend to the middle of the leaflet.

Watson's name is used in preference to that of Rafinesque on account of the doubtful application of the latter name. Rafinesque's whole description is: "*S. pumilus* Raf. of Oregon mountains, has large edible fruits, eaten and dried by the Shoshonis." Where the "Oregon" mountains may be, and which species of mountain-ash were used by the "Shoshonis", if any species was used at all by the tribe of Indians presumably indicated by that title, is very obscure. If by Oregon mountains is meant the Rockies, and that would coincide with the range of the Shoshone Indians, *Sorbus occidentalis* is definitely excluded since it is not known to occur east of the Cascade Mountains of Washington and Oregon. If *S. occidentalis* was really the species intended, which, as indicated above, is very doubtful, the mention of large fruits is scarcely definitive, since the fruits of that species are not

larger than those of any other western American *Sorbus*. It appears therefore that Rafinesque's name must remain a *nomen dubium*.

Sorbus occidentalis is attributed to California on the basis of a specimen collected in 1937 in the Salmon-Trinity Alps, Siskiyou County, California, by Mr. John Thomas Howell (no. 13519). This specimen is not, however, typical *S. occidentalis;* the inflorescence is somewhat larger, and the leaflets are more serrate than in material from Oregon and Washington. In certain respects it approaches the northern *S. sitchensis*. Additional collections are needed to determine the status of *S. occidentalis* in California.

Hedlund (l. c.) ascribes this species to northeastern Asia and Kamtchatka. However, this is not correct because, as previously noted, *S. occidentalis* is confined to a small area in the western part of North America. Evidently some Asiatic species with oligodontous leaflets has been confused with it. The fact that this species does not occur in Kamtchatka is confirmed by Hultén in his scholarly study of the flora of that region (Svenska Vet.-Akad. Handl. **8**: 49. 1929).

11. **Sorbus sambucifolia** (Cham. & Schlecht.) Roemer, Syn. Mon. **3**: 139. 1847; Hedlund, Svenska Vet.-Akad. Handl. **35**: 37. 1901; Schneider, Ill. Handb. Laubholzk. **1**: 667, *fig. 366 a-b*. 1906; Rehder, Man. Cult. Trees Shrubs 378. 1927; Hultén, Svenska Vet.-Akad. Handl. **8**: 46. 1929; Tatew. & Kobay. Contrib. Fl. Aleutian Isl. 54. 1934; Hultén, Fl. Aleutian Isl. 220. 1937.

Pyrus sambucifolia Cham. & Schlecht. Linnaea **2**: 36. 1827; Torrey & Gray, Fl. N. Am. **1**: 472, 1840.

A shrub 1–2 m. tall; bark gray, smooth; winter-buds glutinous, glossy, slightly rufous pubescent; lenticels few, oval; stipules adnate to the petioles, rufous pilose, membranaceous, lanceolate, deciduous; leaflets 7–11, 3–7 cm. long, lanceolate to ovate-lanceolate or oval, acuminate, usually broadest at the asymmetrical base, dull lustrous green above, paler beneath, soon quite glabrous on both sides; margins sharply serrate almost to the base, the teeth 45–55 on each leaflet; terminal leaflet oval; rachis pilose or glabrate; inflorescence round-topped, 3–5 cm. broad, 8–15-flowered; pedicels and peduncles sparingly rufous pubescent; flowers 1–1.5 cm. in diameter; calyx 5–6 mm. long, the sepals sparingly ciliolate, erect in fruit, rather large, triangular, pubescent within, glabrous on the back; petals oval or roundish 4–5 mm. long; stamens about as long as the petals; styles 5, 1.5 mm. long; top of the ovary pubescent; fruits few, ellipsoid, glaucescent, 1–1.5 cm. in diameter; seeds lanceoloid, symmetrical, dark brown, not flattened, 4 mm. long, 2 mm. wide.

SORBUS ALASKANA G. N. Jones

SORBUS CASCADENSIS G. N. Jones

FULL-TONE — MERIDEN

TYPE LOCALITY: Petropavlovsk, Siberia.

RANGE: Japan and the Commander Islands to Kamtchatka and the westernmost Aleutian Islands.

ALASKA: Attu Isl., August 29, 1891, *J. M. Macoun* (Can, US), *Dall* (G), *Hultén 6112* (G, NY), *6809* (NY).

This is a very distinctive species, not closely related to any other in North America. It occurs in the western hemisphere only on some of the westernmost islands of the Aleutian archipelago, and all the numerous references in botanical literature to *S. sambucifolia,* or *Pyrus sambucifolia,* from continental North America apply to other wholly different species. Hultén (l. c.) reports it to occur on Buldir, Alaid, and Agattu islands as well as Attu.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

STUDIES IN THE LAURACEAE. II[1]
SOME CRITICAL AND NEW SPECIES OF CINNAMOMUM AND NEOCINNAMOMUM

CAROLINE K. ALLEN

Cinnamomum Camphora (L.) Nees & Eberm. Handb. Med. Pharm. Bot. **2**: 430. 1831; Meissner in DC. Prodr. **15**[1]: 24. 1864.

Laurus Camphora Linn. Sp. Pl. 369. 1753.
Camphora officinarum Nees in Wallich, Pl. As. Rar. **2**: 72. 1831.

DISTRIBUTION: tropical Asia and Malaya.

Since the species is so wide-spread and well known, it is unnecessary to include here a citation of specimens.

Cinnamomum Camphora Nees & Eberm. var. **glaucescens** (Braun) Meissner in DC. Prodr. **15**[1]: 24. 1864; Nakai, Bot. Mag. Tokyo **41**: 519. 1927, excl. synon.; Kamikoti, Ann. Rep. Taihoku Bot. Gard. **3**: 79. 1933, "comb. nov."; Ouchi, Sylvia **3**: 125. 1932.[2]

Camphora officinarum var.? *glaucescens* Braun, Verh. Preuss. Gartenb. Ver. **21**: 77. 1852.

DISTRIBUTION: Japan and southeastern China.

CHINA. Fukien: *L. Y. Tai 11473; H. H. Chung 4550; S. T. Dunn 1164 (H. H. 3485).* Chekiang: *O. Warburg 1887, 6647; Y. Y. Ho 972; S. Chen 197, 2971; R. C. Ching 4790, 5153; H. C. Cheo 14586; Y. L. Keng 402; T. M. Tsui 302.* Kwangtung: *C. O. Levine 399, 661, 3289, 3256, 1269; Y. Tsiang 200; W. Y. Chun 7300.* Hunan: *H. Handel-Mazzetti 591 (11748); W. T. Tsang 23678.*

A portion of Wallich's no. 2604, cited by Meissner in De Candolle's Prodromus as *Cinnamomum Camphora,* from the Meissner herbarium, and now in the New York Botanical Garden, is a fragmentary specimen which apparently at one time had a flower cluster. The odor of this, however, is not strictly a camphor odor, but rather more turpentine-like, which is the description Braun gives for *Camphora officinarum* var.?

[1] Ann. Missouri Bot. Gard. **25**: 361-434. 1938.

[2] Ouchi made *C. camphoroides* Hayata a synonym of var. *glaucescens*. Hayata states that except for its densely flowered terminal branches, *C. camphoroides* resembles *C. Camphora*. Presumably the former yields camphor. Braun says nothing concerning the camphor yielding quality of the variety *glaucescens*, but comments upon the turpentine like odor of the leaves. The inflorescence of *C. glaucescens* was not examined, but no specimens at hand having the terebinth odor show a strictly terminal inflorescence. For the present, then, Hayata's species must stand.

glaucescens. Braun states that he has not examined the flowers of the specimen, and is not sure of its value as a species or a variety.

Zollinger no. 2141 from the Meissner herbarium also (fragment at New York), and cited in De Candolle's Prodromus as *C. Camphora glaucescens,* has a distinct camphor odor. Since, as far as can be determined no author has commented on a discrepancy between the publication and the specimens in De Candolle's herbarium, the natural conclusion is that there has been a confusion of labels on the New York specimens. There is another possibility. On the same sheet with Wallich 2604 is a specimen with the label marked "Hort. Bot. Berolin. C. officinarum var.? glaucescens in Herb. Kunth." The specimen has the unmistakable odor of camphor. It is possible that these two labels were reversed in mounting. That, however, does not explain the mislabeling of the specimen called Zollinger 2141. It remains only to await complete examination of the material in the De Candolle herbarium, before a definite conclusion may be reached. As is the case with several species, when in the dried state, the odor seems of doubtful value. It is probable that the odor of the bark is not constant within the species. It has been discovered that some strains of *C. Camphora* do not yield true camphor.[1]

The numbers cited above under the variety *glaucescens,* have the odor which is supposed to be characteristic of the variety, and the leaves are more or less glaucescent on the lower surface.

Cinnamomum nominale Hayata[2] also has been placed under *Cinnamomum Camphora* var. *glaucescens,* but should probably be kept separate, judging from the description. *Cinnamomum nominale* is a shrub, and does not yield camphor. The inflorescence in contrast to that of *C. camphoroides* is loose, few-flowered and axillary. There are other less striking differences revealed upon detailed examination.

Cinnamomum Simondii Lecomte in Nouv. Arch. Mus. Hist. Nat. Paris ser. V, **5:** 73. 1913; Fl. Gén. Indoch. **5:** 111. 1914; Liou, Laurac. Chine Indoch. 26. 1932.

DISTRIBUTION: French Indo-China and western China.

FRENCH INDO-CHINA. Tonkin: *D. Simond 190* (holotype Paris; photo. and fragm. AA). CHINA. Szechuan: *E. H. Wilson 5778.* Kwangsi: *W. T. Tsang 21986.* Yunnan: *A. Henry 11960 B.*

[1]Burkill, Dict. Econ. 1: 548. 1935.

[2]**Cinnamomum nominale** Hayata, Ic. Pl. Formosa **3:** 160. 1913.
Cinnamomum Camphora nominale Hayata in Matsumura & Hayata, Enum. Pl. Formosa 349. 1906; Jour. Coll. Sci. Tokyo **22:** 349. 1906; Hayata, Ic. Pl. Formosa 6, suppl.: 62. 1917; Kamikoti, Ann. Rep. Taihoku Bot. Gard. **3:** 78. 1933, "comb. nov."

A species known only from Tonkin and western China. Wilson no. 5778 cited by Gamble[1] as *C. inunctum* does not seem to belong to the latter, but to *C. Simondii*. The leaves are more or less membranous, uniformly ovate, long-acuminate and often falcate, and the inflorescence densely flowered, slender and graceful.

Cinnamomum platyphyllum (Diels), comb. nov.

Machilus platyphylla Diels, Bot. Jahrb. **29**: 348. 1901; Liou, Laurac. Chine Indoch. 50. 1932.

DISTRIBUTION: known only from western China.

CHINA. S z e c h u a n : *C. Bock & A. v. Rosthorn 1981* (holotype of *Machilus platyphylla*, Berlin; isotype, AA); *F. T. Wang 22673*.

This species, as far as the herbarium material which I have examined is concerned, is represented by the type collection and one other specimen. The isotype of *Machilus platyphylla*, so described, is a flowering specimen on which are a few very young fruits. The calyx-lobes are completely caducous, leaving the tube which enlarges to form the small cupule characteristic of the genus *Cinnamomum*, rather than *Machilus*. Wang no. 22673 in fruit is the only specimen which approaches the Bock and Rosthorn specimen, and Wang's plant is without a doubt a *Cinnamomum*. There are a few differences in the leaves of the two specimens. Diel's type has more spreading lateral veins on the whole; is more glaucous on the under surface of the leaves; and the bases of the latter are less auriculate. In every other respect, the two are alike. Since a great deal of leaf variation occurs throughout the family, it seems permissible to consider the two conspecific. The infrutescence[2] is, like the inflorescence, very slender and fragile, the calyx enlarging only slightly to form a small somewhat flaring cupule 2.5–4.0 cm. broad. The fruit is globose, 1 cm., more or less, in diameter.

The species belongs near *C. Bodinieri*, and resembles it in having dense pubescence on the lower surface.

Cinnamomum glanduliferum (Wall.) Nees in Wallich, Pl. As. Rar. **2**: 72. 1831; Meissner in DC. Prodr. **15**[1]: 25. 1864; Hooker f., Fl. Brit. Ind. **5**: 135. 1886.

Laurus glandulifera Wallich, Trans. Soc. Med. Phys. Calcutta **1**: 45, 51, *t. 1*. 1825.

Cinnamomum Cavalerici Lévl., Fedde, Rep. Spec. Nov. **10**: 370. 1912.

Machilus Dominii Lévl., Fedde, Rep. Spec. Nov. **13**: 174. 1914.

[1]Gamble in Sargent, Pl. Wilson. **2**: 68. 1914.

[2]Fructus globosus, 7-9 mm. longus, 1 cm. diam., calyce leviter dilatato discoideo, margine integro.

DISTRIBUTION: southeastern Asia.

INDIA. Nepal: *N. Wallich 2601* (holotype of *Laurus glandulifera*, Kew; photo. and fragm. AA). Burma: *F. G. Dickason 5957.* CHINA. Yunnan: *Delavay 4105; G. Forrest 7506, 7787, 10630, 16517, 17723; H. Handel-Mazzetti 53 (10233); J. F. Rock 8816, 3009; E. E. Maire s.n.* (holotype of *Machilus Dominii*, Edinb.; photo. and fragm. AA); *C. Schneider 2426.* Szechuan: *C. Schneider 606; F. T. Wang 23648.* Kweichow: *J. Cavalerie in Herb. Bodinier 2630; J. Cavalerie 1084* (holotype of *Cinnamomum Cavaleriei*, Edinb.; photo. and fragm. AA). E. Tibet & southwestern China: *G. Forrest 26388.* Hainan: *H. Fung 20161.*

For discussion see *C. Parthenoxylon* below.

Cinnamomum Parthenoxylon (Jack) Nees in Wallich, Pl. As. Rar. **2**: 72. 1831; Meissner in DC. Prodr. **15**[1]: 26. 1864; Hooker f., Fl. Brit. Ind. **5**: 135. 1886.

Laurus glandulifera sensu Jenkins ex Meissner in DC. Prodr. **15**[1]: 26. 1864. Non Wallich.

Laurus Parthenoxylon Jack, Malay. Misc. **1**[5]: 28. 1820; Bot. Misc. **2**: 76. 1830.

Phoebe latifolia Champion, Hooker's Jour. Bot. **5**: 197. 1853.

DISTRIBUTION: southeastern Asia and Malaya.

MALAY PENINSULA. Penang: *N. Wallich 2602* (holotype of *Laurus Parthenoxylon* Kew; photo. and fragm. AA; isotype Gray). INDIA. Hort. Bot. Calcutta, Herb. Jenkins, (specimen in Kew). CHINA. Szechuan: *T. T. Yü 1107.* Kwangsi: *A. N. Steward & H. C. Cheo 591, 781.* Kweichow: *H. Handel-Mazzetti 332 (10970).* Hunan: *H. Handel-Mazzetti 346 (11059).* Kwangtung: *C.C.C. 12646; S. K. Lau 2181; Y. Tsiang 2337.* Hainan: *W. Y. Chun 5919, 5957; F. C. How 71851; H. Y. Liang 63486, 64146, 64328, 64830; C. Wang 35093.* Hongkong: *Champion 496* (holotype of *Phoebe latifolia*, Kew; photo. and fragm. AA); *W. Y. Chun 5075, 5078, 6623, 6625; Y. Tsiang 271; Wilford s.n.; C. Wright s.n.*

Cinnamomum Parthenoxylon (Jack) Nees and *C. glanduliferum* (Wall.) Nees have been misinterpreted and interchanged for so many years that it is logical that they should be discussed together. Wallich's List no. 2601 (type of *Laurus glanduliferum*) and 2602 (type of *Laurus Parthenoxylon*) have been photographed and hence are available. From the photographs, however, it is difficult to detect much difference be-

tween the two. The descriptions given by Nees show a difference in inflorescence, that of *C. Parthenoxylon* being terminal and corymbose and foliolate before anthesis; that of *C. glanduliferum* being axillary and paniculate, with the lobes pubescent on the outer surface. The leaves of the former are subtriplinerved, dull on the upper surface, eglandular; of the latter subtrinerved, shining above, bluish grey glaucous below, with glands in the axils of the veins.

The subsequent description by Meissner mentions glands or swollen portions in the axil being sometimes present.

From the descriptions, photos and leaf fragments available, I have made a separation of the two species, with the result that, *C. Parthenoxylon* appears largely in Kwangtung and Hainan, and Malayan islands, while *C. glanduliferum* is confined to India and the Malay Peninsula. The former is more variable in leaf shape, size and venation. The latter seems to be more uniform in all three leaf characters. The fruit of the specimens which I have called *C. Parthenoxylon* is globose, 6–8 mm. in diam., subtended by an enlarged narrowly elongated conical calyx tube 1 cm. or less in length, 1 mm. wide at base to 4 mm. at summit, rugose and longitudinally striate.

The inflorescence of *C. glanduliferum* is less compact that than of *C. Parthenoxylon;* the pedicel is frequently recurved; the fruit globose, about 1 cm. in diam., subtended by an enlarged, elongated calyx-tube, conical in shape, usually less than 1 cm. long, 1 mm. wide at base, flaring at summit to 5 mm. forming a shallow undulating disc.

Cinnamomum Pseudosassafras Meissner has been referred to *C. Parthenoxylon.* I have at hand the type quoted by Hooker[1], *Griffith 623,* from Mergui, which does not seem to belong with *C. Parthenoxylon,* or with any variation of it or with *C. glanduliferum.* Some material from Almora, India matches this very well. More representatives, however, are necessary in order to re-establish *C. Pseudosassafras* as a legitimate species.

Cinnamomum japonicum Sieb. ex Nees, Syst. Laurin. 79. 1836, pro syn.; Nakai, Bot. Mag. Tokyo **41:** 517. 1927; Ouchi, Sylvia **3:** 125. 1932, excl. syn.

Cinnamomum pedunculatum Nees, l. c., pro parte.
Laurus Camphora, in herb. Zuccarini, non Linn.

DISTRIBUTION: Japan, Formosa, Corea, Liukiu Islands.

JAPAN: *Siebold,* in 1842 (possibly isotype of *Laurus Camphora,* Gray Herb.?)

[1]Hooker f., Fl. Brit. Ind. **5:** 135. 1886.

For years, the name *Cinnamomum pedunculatum* has been attached to a variety of specimens from all over southeasterrn Asia. It has not been clear exactly what did comprise the true species. Nakai first established the identity of *Laurus pedunculata* Thunberg, upon which Nees, apparently, without having seen the specimen, based *C. pedunculatum*. The specimen, however, as Nakai states, is *Hedyotis pedunculata* (Thbg.) Nakai. Nees cites *C. japonicum,* a specimen he has seen in Siebold's herbarium, and which he considers conspecific with *Laurus pedunculata*. Meissner, in De Candolle's Prodromus, adds a short description of the flower. The resulting confusion has persisted for almost a century. The following will be an attempt to delineate the species heretofore passing as *C. pedunculatum*. *Cinnamomum pedunculatum* of Nees, now known as *C. japonicum,* occurs only in Japan, Formosa, Corea and the Liukiu Islands. There are records of misnamed *C. pedunculatum* from China, but these specimens are found to be *C. Burmanni*. The leaves of *C. japonicum* are long-petiolate, and reticulate. The prominence of the reticulations depending on the coriaceous quality of the leaves, or perhaps on the amount of oil present. It is not a stable character, in this species at least. The flowers are arranged in long-pedunculate umbels. The twigs give off a distinct odor of camphor when the bark is scraped. The branches bearing mature fruit are heavier, the leaves larger and more coriaceous, enough so that at first glance they might be thought to be a different species. The Liukiu Island specimens are heavier and larger than the Japanese, but show the same type of fruit. All have some kind of camphor odor, except two specimens; one collected for L. Boehmer in 1904, and the other by E. H. Wilson, no. 8115. These two have a sweetish odor. Again this may be due to circumstance of growth, or it may be that this is indeed another strain with the fragrant essential oil predominant. Since there are only two of this type at hand, no further disposition of them is made, than the mention of the difference in odor. There is a group of plants collected in Corea, which show differences from the Japanese *C. japonicum*. They are coarser, heavier plants, even in the flowering stage, the leaves vary in shape and have a tendency to become acuminate. Perhaps this group belongs near *C. osmophloeum* Kanehira, but it is difficult to say definitely without more material of the latter. The leaves are smaller than in the latter species; are usually less coriaceous and are reticulate in the manner of *C. japonicum*. The twigs have a mixed champhor and spice odor, and are shining red-brown. These have been placed for the time being under *C. japonicum*.

Another species belonging in the *C. japonicum* group is *C. Sieboldii*

Meissner. The leaves are not reticulate; they are ovate to lanceolate-oblong, coriaceous and glaucous on the lower surface. The inflorescence, which is strikingly different from that of the former, is composed of numerous slender, axillary, subumbellate racemes, with large glabrous flowers on very slender, long pedicels. This species occurs in Japan only.

Cinnamomum Burmanni (Nees) Blume, Bijdr. 569. 1825; Hooker f., Fl. Brit. Ind. **5**: 136. 1886; Chun, Contr. Biol. Lab. Sci. Soc. China **1**[5]: 13. 1925; Liou, Laurac. Chine Indoch. 33. 1932.

Laurus dulcis Roxburgh, Hort. Bengal. 30. 1814, nom. nud.; Wallich, List No. 2581B. 1830, nom. nud.; Roxburgh, Fl. Ind. **2**: 303. 1832.
Laurus Burmanni C. G. & T. F. L. Nees, Disput. Cinn. 57, *t. 4*. 1823.
Cinnamomum dulce Nees in Wallich, Pl. As. Rar. **2**: 75. 1831.
Cinnamomum chinense Blume, l. c.

DISTRIBUTION: southeastern Asia and Malaya.

CHINA: Hainan: *W. Y. Chun 5865, 5943; N. K. Chun & C. L. Tso 44280, 44323, 44338; H. Fung 20173, 20381; F. C. How 71377, 71876; H. Y. Liang 64447, 64448, 64513, 65124; W. T. Tsang 82, 498; C. Wang 34284, 34584, 35013, 36164.* Kwangtung: *C. O. Levine & G. W. Groff 136; T. K. Ping 10974; Y. Tsiang 1786; C. L. Tso 21466; C. L. Tso & Y. Tsiang 2042; T. M. Tsui 40.* Kwangsi: *A. N. Steward & H. C. Cheo 281.* FRENCH INDO-CHINA. Annam: *A. Chevalier 41220.* INDIA: *N. Wallich 2581B* (syntype of *Laurus dulcis* Roxb., isotype Kew; photo. and fragm. AA).

Numerous specimens from Hainan and Kwangtung as well as other provinces of China have been placed under *Cinnamomum pedunculatum* Nees, which is now known as *C. japonicum Sieb.* These are not *C. japonicum* but belong under *C. Burmanni* Bl. The odor of the young stems is that of a very sweet sandal-wood. That of the bark is distinctly cinnamon-like. It has been known for centuries that different portions of the tree, as Loureiro mentions in a discussion of *Laurus Cinnamomum*[1] yield oil of different qualities.

The specimens cited below are similar in every respect to *C. Burmanni*, but the odor is not that of cinnamon or camphor, but a mixture of both. Here is a problem which may be one of those brought up when hybrids are formed naturally or through cultivation; or the group of plants under discussion may be a different strain of the same species. It is an interesting fact that these specimens, when the bark of the twigs is first scraped, give a disagreeable camphor-spice odor, which, after

[1]Loureiro, Fl. Cochinch. **1**: 249. 1790; ed. 2. 309. 1793.

several minutes, becomes delicately spicy. This would indicate definitely the presence of two elements in the bark; one the oil of camphor, which is extremely volatile; the other, the oil of cinnamon, which is more inert. For the present, these specimens are not separated even as variety, but attention is called to this point. The majority of these plants occur in Kwangtung. It is interesting to note from field labels, that the colloquial name given to this plant in Kwangtung is "False Cinnamon Tree".[1]

China. Hainan: *W. Y. Chun 118, 7327, 30427, 30524; C. Ford, s.n.; S. K. Lau 788, 2706; S. P. Ko 52121; C. O. Levine 173, 343, 400, 449, 969; F. A. McClure 7956; K. P. To & Y. Tsiang 12961; W. T. Tsang 32; C. L. Tso 21479; C. Wang 407.* Fukien: *H. H. Chung 1329, 1658, 8427.* Hupeh: *H. C. Chow 48.*

That a great variation occurs in this species can be ascertained by glancing through the specimens represented under the species. Liou, from the Indochinese material alone has separated four varieties, α, β, γ and δ, on leaf texture and pedicel length, for the most part. Since the species occurs in such profusion, not only in Indochina but in other parts of tropical Asia and Malaya as well, and is widely cultivated, it is not unreasonable to suppose that hybridization has produced many variants. Only the one variety following is recognized by the author.

Cinnamomum Burmanni Blume var. **angustifolium** (Hemsl.), comb. nov.

Cinnamomum pedunculatum Nees var. *angustifolium* Hemsley, Jour. Linn. Soc. Bot. **26**: 373. 1891; Chun, Contr. Biol. Lab. Sci. Soc. China **1**[5]: 14. 1925; Liou, Laurac. Chine Indoch. 37. 1932; Allen, Jour. Arnold Arb. **17**: 325. 1936.

Cinnamomum linearifolium Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V, **5**: 79. 1913; Liou, Laurac. Chine Indoch. 32. 1932.

?*Laurus Heyneana* Wallich, List No. 2576. 1930, nom. nud.

?*Cinnamomum Heyneanum* Nees in Wallich, Pl. As. Rar. **2**: 76. 1831; Hooker f., Fl. Brit. Ind. **5**: 136. 1886.

Distribution: southern Asia.

China. Kweichow: *J. Cavalerie 3082* (holotype of *C. linearifolium,* Paris; isotype, NY; photo. AA). Szechuan: *E. Faber 575* (syntype of *C. pedunculatum* var. *angustifolium,* Kew; isotype, NY; photo. AA). Hupeh: *A. Henry 1193, 1353* (syntypes of *C. pedunculatum* var. *angustifolium,* Kew; isotypes, Gray); *A. Henry 1293, 2759, 3466, 3881* (syntypes of *C. pedunculatum* var. *angustifolium* not seen, Kew). India: *N. Wallich 2576* (iso-holotype of *Laurus Heyneana,* Kew; photo. AA).

[1]Burkill, Dict. Econ. **1**: 546. 1935.

The variety does not in any way resemble what has been known as *C. pedunculatum* now known as *C. japonicum*. Although a photograph only of a sterile branch of *Laurus Heyneana* Wall. is available, it seems probable that this is the same as *C. Burmanni angustifolium*.

Cinnamomum Loureirii Nees, Syst. Laurin. 65. 1836 (based on *Laurus Cinnamomum*); Meissner in DC. Prodr. **15**[1]: 16. 1864; Lecomte, Not. Syst. **2**: 336. 1913; Nouv. Arch. Mus. Hist. Nat. Paris sér. V, **5**: 80. 1913; Merrill, Trans. Am. Phil. Soc. **14**[2]: 164. (Comm. Loureiro Fl. Cochinch.) 1935.

Laurus Cinnamomum sensu Loureiro, Fl. Cochinch. 249. 1790; ed. 2. 309. 1793, non Linn.

Cinnamomum obtusifolium Nees var. *Loureirii* Perr. & Eberh., Bull. Sci. Pharm. **16**: 574, *t. 3*. 1909; Burkill, Dict. Econ. **1**: 553. 1935.

DISTRIBUTION: French Indo-China.

FRENCH INDO-CHINA. Annam: *J. & M. S. Clemens 3523*. Tonkin: *A. Petelot 1949*.

This is a much disputed species, since there is no extant type. The material which seems to answer the description given by Loureiro, comes from near the type locality in Indochina. It has a sweet sandal-wood odor. Loureiro mentions the fact that it is fairly rare, which is certainly true, if one can judge from the scarcity of herbarium specimens. The *Cinnamomum Loureirii* from Japan cited by Nees, bears no resemblance to the Indochinese specimens that conform to Loureiro's original description. The Japanese specimens have a sweet spicy odor. It would seem that Nees has merged under one name two distinct entities, and that the true *C. Loureirii* as Merrill[1] suggests should refer to Loureiro's specimen and not to the Japanese plant. Thus the Japanese plant should have another name.

At this point it seems pertinent to discuss the so-called Saigon cinnamon used commercially, and described by O. A. Farwell from the bark alone as *Camphorina saigonensis*.[2] As Merrill[3] commented in his discussion on the subject, the commercial cinnamon must necessarily be a wide-spread species, hence it cannot have escaped the notice of collectors and taxonomists for all of these years. Chevalier believes that it is either purchased from Chinese or Annamese merchants and thus brought into the port of Saigon, or else it is furnished by *C. Loureirii*. This latter belief would indicate that *C. Loureirii* is a wide-spread species, a fact belied by the scarcity of herbarium specimens. Dr. Heber W.

[1]Merrill in Trans. Am. Phil. Soc. **14**[2]: 164 (Comm. Loureiro Fl. Cochinch.). 1935.
[2]O. A. Farwell, Druggists Circular **62**: 535. 1918.
[3]Merrill, Bot. Gaz. **70**: 84. 1920.

Youngken of the Massachusetts College of Pharmacy, of Boston, very kindly examined a specimen of bark sent by Park, Davis Co., the so-called Saigon cinnamon of commerce. This he announced to be different microscopically from the *Cinnamomum Loureirii* bark with which he is familiar. At the same time, he examined the bark of *C. Burmanni* which has been mislabeled *C. pedunculatum*. The latter species is wide-spread, with a definite cinnamon odor. It was thought that this might be the Saigon cinnamon. Dr. Youngken, however, stated that it in no way resembled the latter microscopically. It is possible that since there has been such a demand for the product, and the tree has been cultivated for so many years, that there is a great deal of hybridization between the various strains. This fact might account very reasonably for the difference in structure of the bark as shown on microscopic examination. Thus *Cinnamomum Burmanni* seems to be the most logical species to assume as being the one which Farwell used in his description. Unless we accept this, we are no nearer the solution of its identity than we were at the outset. Farwell most curiously based his new binomial strictly on a bark specimen from commercial sources.

Cinnamomum Tamala Nees & Eberm. Handb. Med. Pharm. Bot. **2:** 426. 1831; Nees in Wallich, Pl. As. Rar. **2:** 75. 1831; Meissner in DC. Prodr. **15**[1]**:** 17. 1864; Hooker f., Fl. Brit. Ind. **5:** 128. 1886; Hemsley, Jour. Linn. Soc. Bot. **26:** 373. 1891; Chun, Contr. Biol. Lab. Sci. Soc. China **1**[5]**:** 14. 1925; Liou, Laurac. Chine Indoch. 34. 1932.

Laurus Cassia Wallich, List No. 2580B. 1830, nom. nud.

Laurus albiflora Wallich, List No. 2569A. 1830, nom. nud.

Cinnamomum albiflorum Nees in Wallich, Pl. As. Rar. **2:** 75. 1831; **3:** 36. 1832; Syst. Laurin. 58. 1836; Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V, **5:** 75. 1913; Fl. Gén. Indoch. **5:** 113. 1914; Liou, Laurac. Chine Indoch. 34. 1932.

Cinnamomum Tamala Nees var. *albiflorum* Meissner in DC. Prodr. **15**[1]**:** 18. 1864; Liou, Laurac. Chine Indoch. 34. 1932, pro syn.

DISTRIBUTION: southeastern Asia.

INDIA. Silhet: *N. Wallich 2580B* (iso-holotype of *Laurus Cassia,* Kew; photo. AA). Nepal: *N. Wallich 2569 A* (iso syntype of *Laurus albiflora,* Kew; photo. AA).

Since Nees' time *Cinnamomum Tamala* and *C. albiflorum* have been confused. Meissner in 1864 made *C. albiflorum* a variety of *C. Tamala.* Hooker in 1886 reduced *C. albiflorum* to synonymy under *C. Tamala.* Lecomte re-established the former as a species. The reasons he gave, however, are the differences in the inflorescences of the two and in the leaves. These differences, in view of considering the species a wide-

spread entity instead of a localized one, become not specific in their importance but rather fall into place as local variations of a single species. Lecomte has mentioned the fact that the lobes of the corolla are completely caducous in *C. Tamala* and incompletely so, forming the truncate margin of the fruit cupule in *C. albiflorum*. The specimens at hand do not show this.

Near *C. Tamala* is, according to Parker[1], *C. cacharense* from India, the difference being that the latter species has more slender panicles, smaller flowers with relatively broader perianth lobes, which are completely deciduous in fruit, leaving the cup with an entire margin. The margin in *C. Tamala* is truncated at the base from the cupule.

Cinnamomum Wilsonii Gamble in Sargent, Pl. Wilson. **2**: 66. 1914; Chun, Contr. Biol. Lab. Sci. Soc. China **1**[5]: 15. 1925; Liou, Laurac. Chine Indoch. 30. 1932.

Cinnamomum Wilsonii var. *multiflorum* Gamble in Sargent, Pl. Wilson. **2**: 67. 1914; Liou, Laurac. Chine Indoch. 30. 1932.

DISTRIBUTION: central China.

CHINA. Hupeh: *E. H. Wilson 2003, 2098, 2227, 5183* (syntypes of *Cinnamomum Wilsonii*, AA); *E. H. Wilson 3712* (holotype of *Cinnamomum Wilsonii* var. *multiflorum*, AA).

Regarding *C. Wilsonii* and its variety it might be well to mention a difficulty which arose while they were being studied. The distinctions which Gamble noted as separating the variety from the species do not prove to be constant for the numbers mentioned. Wilson no. 2227, for example, is certainly nearer the variety than the species. It is possible, however, that the labels for the two numbers were interchanged in handling.

Cinnamomum Jensenianum Handel-Mazzetti, Anz. Akad. Wiss. Wien Math.-Nat. **1921**: 63 (Pl. Nov. Sin. Forts. **10**: 1); Symb. Sin. **7**[1]: 249. 1931; Liou, Laurac. Chine Indoch. 39. 1932.

DISTRIBUTION: central China.

CHINA. Hunan: *H. Handel-Mazzetti 12287* (holotype of *Cinnamomum Jensenianum*, Vienna; isotype, AA).

Cinnamomum Lioui, spec. nov.

Cinnamomum albiflorum Nees var. *kwangtungensis* Liou, Laurac. Chine Indoch. 35. 1932.

Arbor 13 m. alta, ramis fuscis teretibus, odore camphorae, glabrescentibus vel glabris, ramulis subangulatis pubescentia brevi adpressa pallide fusca tectis. Folia elliptica, 4–6 cm. longa, 1.5–2.3 cm. lata,

[1]Parker in Fedde, Rep. Spec. Nov. **31**: 126. 1932.

supra opaca, subtus pallida, subcoriacea, acutissime acuminata, cuneata, subtus nervis sparse pubescentibus exceptis glabra, 3-pli-nervia, nervis supra inconspicuis subtus prominentibus, circa 4 mm. supra basin laminae divergentibus, lamina plerumque sensim in petiolum attenuata, petiolo circa 1 cm. longo, tenui pubescente. Inflorescentia axillaris et subterminalis, paniculato-cymosa, foliis longior, 6–10 cm. longa, subflavo-cana, pubescens, axi primario paniculata ramulorum paribus 2–3, axibus II-III ordinis cymosis, ultimis cymulis 3-vel rarius 2-floris; pedunculo ad 5.5 cm. longo, pedunculis 2ndi ordinis apicem versus decrescentibus, infimis circa 12 mm. longis; pedicellis 2–3 mm. longis. Flores subviridi-cani, 3–4 mm. longi, lobis 6 ad 3 mm. longis ovatis obtusis, 3 exterioribus quam interiora brevioribus, staminibus 9, 2 mm. longis, antheris oblongis filamenta aequantibus, filamentis in facie posteriore sparse pubescentibus, 6 introrsis, 3 interioribus biglandulosis extrorsis, staminodiis 3 cordatis stipitatis, stipite in facie posteriore pubescente; stylo quam ovarium ovoideum triente longiore; stigmate orbiculari in apice styli lateraliter posito. Fructus ignotus.

DISTRIBUTION: Kwangtung.

CHINA. Kwangtung: Lok Chong, *C. L. Tso 20807,* May 28, 1929, tree 13 m. high, diam. 50 cm. (holotype of *C. albiflorum* var. *kwangtungensis,* NY).

Liou described this specimen as a variety of *C. albiflorum.*[1] It does not seem to be very closely related to the latter, but to be worthy of specific rank. Since there is already a *C. kwantungense* it is named after Liou, author of the variety and a monographer of the family. *Cinnamomum Lioui* has a slender graceful flowering branch as compared with the rather stiff inflorescence of *C. albiflorum.* The leaves of the latter are 10–11 cm. in length and the flowers measure 5–6 mm. long, in contrast to the leaves of *C. Lioui,* which are 6 cm. long at most, and to the flowers which are never more than 3.5 mm. long. The inflorescence of *C. Lioui* projects several centimeters beyond the leaves, whereas that of *C. albiflorum* is rarely even with the leaves. *Cinnamomum Lioui* has a camphor-like odor whereas *C. albiflorum* has a faint delicate perfume.

Cinnamomum tonkinense (Lecomte) A. Chevalier, Bull. Econ. Indoch. **21:** 856. 1918.

Cinnamomum albiflorum Nees var. *tonkinensis* Lecomte, Fl. Gén. Indoch. **5:** 115. 1914.

DISTRIBUTION: known only from type locality.

[1] *Cinnamomum albiflorum* Nees is now a synonym of *C. Tamala* Nees & Eberm.

FRENCH INDO-CHINA. Tonkin: *Balansa s.n.* (holotype of *C. albiflorum* var. *tonkinensis,* Paris; photo. AA).

This species has smaller leaves, more definitely lanceolate and short panicles not exceeding 4 cm., axillary only, and not borne near the summit of the branches. In respect to the position of the inflorescence, the species is similar to those specimens of *C. Wilsonii* which occur in central China. It is doubtful whether *C. tonkinensis,* in view of the previous discussion, is worthy of specific rank. More abundant material from Indochina will aid in this decision.

Cinnamomum Cassia (Nees) Nees & Eberm. ex Blume, Bijdr. 570. 1825; Handb. Med. Pharm. Bot. **2**: 424. 1831; Meissner in DC. Prodr. **15**[1]: 12. 1864; Hooker f., Fl. Brit. Ind. **5**: 130. 1886; Lecomte, Fl. Gén. Indoch. **5**: 116, *fig. 11.* 1914; Chun, Contr. Biol. Lab. Sci. Soc. China **1**[5]: 13. 1925; Liou, Laurac. Chine Indoch. 28. 1932.

Laurus Cassia C. G. & T. F. L. Nees, Cinn. Disput. 53. *t. 3.* 1823, excl. syn. pl.

Cinnamomum aromaticum Nees in Wallich, Pl. As. Rar. **2**: 74. 1831.

DISTRIBUTION: China? Cultivated in all tropical Asia and Malaya.

BRITISH INDIA. Malabar: *?Rheede s. n.* (syntype of *Laurus Cassia,* Leiden? not seen.) CHINA. Kwangtung: *W. T. Tsang 1201.* Kwangsi: *R. C. Ching 8289.*

This species also, has been confused with the so-called *C. pedunculatum,* or *C. Burmanni. Cinnamomum Cassia* is easily distinguished. First, by the very strong odor of pure spice, unadulterated by any other element; second, by the extremely large leaves, shining above, with veins very prominent below; the large spreading inflorescence, and finally the calyx enlarging to form a deep cupule with a scalloped margin. There are very few specimens known thus far from China.

I have at hand a photograph of *Cinnamomum Cassia* agreeing with the illustration of Nees' publication of 1823. Apparently the photograph is of an authentic specimen from Blume's herbarium. Blume presumably had access to the *Laurus Cassia* of Nees, but Nees mentions three specimens, Rheede's from British India, Loureiro's from Cochinchina which refers to *C. Loureirii,* and Viery's from Sumatra. Which of these is represented by the photograph is impossible to determine, without consulting Blume's herbarium.

Cinnamomum ovatum, spec. nov.

Arbor 22 m. alta, ramis glabris teretibus striatis, odore diluto-aromatico, ramulis glabris subangulatis. Folia ovata, 4–8 cm. longa,

2.5–4.5 cm. lata, viridia, supra nitida, obtusa vel acuta, glabra, 3-pli-nervia, nervis supra basim laminae varie divergentibus, inconspicue reticulata, petiolo 1–2 cm. longo, glabro. Inflorescentia subterminalis vel axillaris cymosa subumbellata, 4–6 cm. longa, pubescentia sparse adpressa, 3-ramis, ramo centrali unifloro, ramis 2 lateralibus 2–3-floris, pedicellis 6–10 mm. Flores ignoti. Calyx dilatatus margine integro vel undulato, fructum immaturum includens.

DISTRIBUTION: Hainan.

CHINA. H a i n a n : Dung Ka to Wen Fa, alt. 1700 ft. 1932-33, tree 22 m. high, diam. 50 cm., *N. K. Chun & C. L. Tso 43739* (AA).

This species is similar in habit to *C. Burmanni,* the difference being in the ovate leaves and the fruit cupule which is entire. In leaf shape it resembles *C. Caryophyllus* (Lour.) Moore. Until flowering material is collected, no further comparison can be made. The characters exhibited by the fruiting specimen place it without doubt in the genus *Cinnamomum.* Such striking characters as the above mentioned warrant a description on the fruiting specimen alone.

Cinnamomum Tsoi, spec. nov.

Arbor 12 m. alta, ramis teretibus glabris, odore aromatico terebinthino, ramulis teretibus, maturitate tomento fusco adpresso brevi crispo sparse tectis. Folia elliptico-lanceolata, 7–11 cm. longa, 1.5–3.5 cm. lata, fusco-viridia, coriacea, acuminata, basi cuneata, supra glabra, subtus pubescentia crispa sparsa, 3-pli-nervia, subtus nervis valde prominentibus, nervis lateralibus ad marginem ramosis, petiolo 6–10 mm. longo maturitate glabro. Inflorescentia subterminalis vel axillaris paniculata, fere adpresse tomentosa. Flores ignoti; Fructus ellipsoideus, apiculatus, 1.5 cm. longus, minus quam 1 cm. in diam., glaber, cupula lignea circa 0.5 cm. longa margine integro subtentus.

DISTRIBUTION: Hainan.

CHINA. H a i n a n : Fan Yah, alt. 2400 ft., *N. K. Chun & C. L. Tso 44128,* 1932-33, tree 12 m. high, diam. 45 cm. (AA).

Superficially the species is similar to the following species, but differs in the type of inflorescence and pubescence, and the odor of the bark.

Cinnamomum Merrillianum, spec. nov.

Frutex 1 m. altus, ramis glabrescentibus vel glabris teretibus, odore acri aromatico, ramulis teretibus, pubescentia densa argenteo-sericea mox fuscescente et evanida tectis. Folia oblongo-lanceolata, 6–10 cm. longa, 1.5–2.3 cm. lata fusco-viridia, coriacea, attenuato-acuminata, basi rotundata ad cuneata, folia nova supra argenteo-sericea, matura

glabra, subtus pallide fusco-sericea, mox glabra, 3-pli-nervia nervis subtus valde prominentibus pubescentia primo argentea, mox subrufo-fusca, venis transversis obscuris, petiolo 5–12 cm. longo primo pubescente mox glabrescente vel glabro. Inflorescentia axillaris cymosa 1–3-flora, argenteo-sericea; pedunculis 0.5–2.5 cm. longis, pedicellis 3.5–5 mm. longis. Flores viridi-cani 3–4 mm. longi, lobis 6 ovatis 2 mm. longis intus strigosis; staminibus 9 circa 1 cm. longis, in facie posteriore pubescentibus, 3 interioribus biglandulosis extrorsis, glandulis stipitatis; staminodiis 3 triangularibus; ovario oblongo-ovoideo glabro 1 mm. longo, stylo gracili 1.5 mm. longo, stigmate obscure trilobato. Fructus ignotus.

DISTRIBUTION: Hainan.

CHINA. H a i n a n : *H. Y. Liang 63752*, Oct. 23, 1933, shrub 1 m., on mountain top, (AA).

A striking species, with silvery pubescence completely covering the young branchlets and inflorescence. *Cinnamomum Merrillianum* in leaf shape and pubescence resembles *C. Chingii,* but the inflorescence is few flowered, much shorter, never exceeding 2 cm. in length, and the leaves are smaller and narrower.

Cinnamomum Liangii, spec. nov.

Arbor plus quam 19 m. alta, ramis glabris teretibus striatis, odore suavi-aromatico, ramulis glabris angulatis. Folia elliptico-lanceolata, 6–13 cm. longa, 2.4–4 cm. lata, fusco-viridia, membranacea, acuminata, acuta vel fere rotundata, glabrata, 3-pli-nervia, nervis fulvis, supra basim laminae varie divergentibus, petiolo 5–7 mm. longo glabro. Inflorescentia subterminalis vel in ramulis brevibus lateralibus, simpliciter racemosa, 3–7 cm. longa, pedicellis 3–5 mm. longis. Flores ignoti. Fructus ellipsoideus, apiculatus, ad 1.3 cm. longus, 7–8 cm. diam., glaber, cupula brevi ad 3 cm. longa irregulariter crenulata glabra subtentus.

DISTRIBUTION: Hainan.

CHINA. H a i n a n : Seven Finger Mt., *H. Y. Liang 61708*, April 30, 1932, tree 19 m. high, diam. 4 m. (AA).

A species resembling *C. graciliflorum* Gamble from India as nearly as can be told from the photographs of the latter. The cupule of *C. Liangii,* however, is more shallow and the leaves less long-acuminate.

Cinnamomum curvifolium (Lour.) Nees, Syst. Laurin. 80. 1836; Meissner in DC. Prodr. **15**[1]: 23. 1864; Merrill, Trans. Am. Phil. Soc. **24**[2]: 163 (Comment. Loureiro Fl. Cochinch.) 1935, pro parte.

Laurus curvifolia Lour. Fl. Cochinch. 252. 1790, ed. 2. 309. 1793.
Laurus pauciflora Wallich, List No. 2579. 1830, nom. nud.
Cinnamomum pauciflorum Nees in Wallich, Pl. As. Rar. **2**: 75. 1831; Hooker f., Fl. Brit. Ind. **5**: 129. 1886.
Laurus recurvata Roxburgh, Hort. Bengal. 30. 1814, nom. nud; Fl. Ind. **2**: 301. 1832.
Cinnamomum recurvatum Wight, Ic. *t. 133*. 1839.

DISTRIBUTION: southeastern Asia.

INDIA. Silhet: *N. Wallich 2579* (iso-holotype of *Laurus pauciflorum*, Kew; Gray). CHINA. ?(type of *Laurus recurvata* mentioned by Roxburgh without number or locality.)

Point for point, in his description of *Laurus curvifolia*, Loureiro has described a *Cinnamomum*, until two lines from the last: "ibique illorum quodlibet e 4 foraminibus emittens 4 filamenta tenuissima antherulis totidem, oblongis, 2-locularibus." The only discrepancy appears to be the "2-locularibus." Since it has been shown by Merrill in his Commentary on Loureiro's Flora, that Loureiro's descriptions are not always accurate, and since in every other respect the plant is a *Cinnamomum*, it may without hesitation be placed under that genus. Merrill has reduced *C. albiflorum* to *C. curvifolium*. The leaves of the former are not reflexed or incurved; nor are they obsoletely 3-nerved. The racemes are large rather than small. On the other hand, the leaves of *C. pauciflorum* or *C. recurvatum* are not obsoletely 3-nerved and they are opposite or nearly so. The description of *L. curvifolia*, however, seems to point toward the last two mentioned species.

Cinnamomum Appelianum Schewe in Handel-Mazzetti in Anz. Akad. Wiss. Wien. Math.-Nat. 1924: 20 (Pl. Nov. Sin. Forts. **24**: 1); Symb. Sin. **7**[1]: 250. 1931; Liou, Laurac. Chine Indoch. 30. 1932.

DISTRIBUTION: central and western China.

CHINA. Hunan: *T. H. Wang* (*Handel-Mazzetti 75*) (holotype, Vienna; isotype, AA). Kwangsi: *W. T. Tsang 28283; T. S. Tsoong 81565*.

Handel-Mazzetti notes a similarity to *C. Bonii* Lecomte from Tonkin, in the indument, but comments on the difference in length of panicles and the inflorescence.

Cinnamomum Tsangii Merrill, Lingnan Jour. Sci. **13**: 26. 1934.

DISTRIBUTION: known only from type locality.

CHINA. Kwangtung: *W. T. Tsang 20439* (holotype, NY; photo. and fragm. AA).

The similarity between this species and the preceding one is so

marked that I feel sure they are the same. I am keeping them distinct for the reason that the material is scant and the localities rather far apart. That, however, will be remedied with more abundant material, I feel sure. The only difference which I can discover is the presence in *C. Appelianum* of numerous well-defined lateral veinlets extending from the two main laterals upward towards the midrib. The venation is scarcely noticeable on the upper surface, but very prominent below. These lateral veinlets are lacking in *C. Tsangii,* except in one case where there is a suggestion of one lateral veinlet towards the base of the leaf. In the latter, the laterals join the midrib nearer the base than in *C. Appelianum.* The fact that *C. Tsangii* is represented by fruiting specimen only and the type of *C. Appelianum* is in flower, does not obscure the fact that the two are close. In fact, the type inflorescence of both species is unique in the genus, since it is short, axillary and rather stiff. The only other species which approaches it in this respect is *C. curvifolium.*

Cinnamomum pittosporoides Handel-Mazzetti, Anz. Akad. Wiss. Wien. Math.-Nat. 1924: 19 (Pl. Nov. Sin. Forts. **24:** 1); Symb. Sin. **7**[1]**:** 248. 1931; Liou, Laurac. Chine Indoch. 32. 1932.

DISTRIBUTION: known only from Yunnan.

CHINA. Yunnan: *Handel-Mazzetti 6245* (holotype, Vienna; isotype, AA); *Simeon Ten 402.*

Handel-Mazzetti has drawn attention in the Symbolae Sinicae to the unusual characteristics of the above species. The fact that the inner cycle of stamens has the two top locules in a lateral position as compared with the two lower locules, is not a very strong character, he points out, since other members of the genus have this also. Many times a freak twisting of the anther causes one or the other pair of anthers to appear lateral, but they are still in two planes, which is not the case of the truly lateral locules found only in *Neocinnamomum.* The flower structure of Handel-Mazzetti's species except for the unusual anthers of the third cycle of stamens is typically that of *Cinnamomum.* The fruit, however, which hitherto has been undescribed, is larger than that of any known *Cinnamomum,* being 2.5–3 cm. long by 2 cm. broad, ellipsoid-ovoid, falcate, the surface coarsely rugose, apiculate, attenuate at the base and subtended by an enlarged ligneous coriaceous calyx, somewhat fluted and slightly reflexed. The pericarp of the fruit is woody, several millimeters in thickness, at base and apex, and of varying thickness elsewhere. The fruit is not typical *Cinnamomum,* but since the floral parts are, the species is left in that genus.

Cinnamomum iners Reinwardt ex Blume, Bijdr. 570. 1825; Nees in Wallich, Pl. As. Rar. **2:** 73. 1831; Meissner in DC. Prodr. **15**[1]**:** 19. 1864; Hooker f., Fl. Brit. Ind. **5:** 130. 1886; Lecomte, Fl. Gén. Indoch. **5:** 116. 1914; Liou, Laurac. Chine Indoch. 30. 1932.

Laurus Malabathrum Wallich, List No. 2583A. 1830, ex parte, nom. nud.
Laurus iners Reinwardt ex Nees in Wallich, Pl. As. Rar. **2:** 73. 1831, pro synon. praecedentis.

DISTRIBUTION: Malaysia, Ceylon and the Malay Peninsula.

JAVA: *Blume?* (holotype? of *Laurus iners,* Leiden; photo. AA), *N. Wallich no. 2583A,* ex parte (isotype of *Laurus Malabathrum,* Kew; photo. AA).

Cinnamomum obtusifolium Nees in Wallich, Pl. As. Rar. **2:** 73. 1831; Syst. Laurin. 33. 1836; Meissner in DC. Prodr. **15**[1]**:** 12. 1864; Hooker f., Fl. Brit. Ind. **5:** 128. 1886; Lecomte, Fl. Gén. Indoch. **5:** 115. 1914.

Laurus obtusifolia Roxburgh, Hort. Bengal. 30. 1814, nom. nud.
Laurus obtusifolia Wallich, List No. 2574A, C. 1830, nom. nud.

DISTRIBUTION: India and China.

INDIA. Silhet: *N. Wallich 2574A* (iso-syntype, Kew; AA); *N. Wallich 2574C* (iso-syntype not seen, Kew). CHINA. Yunnan: *A. Henry 10440, 12819; C. Wang 75287, 77253, 77370.* Hainan: *F. C. How 72078; S. K. Lau 3573; H. Y. Liang 64620, 64951, 65328; C. Wang 36576, 36175.*

The two last mentioned species should be considered together, since there has been a great deal of confusion between them. *Cinnamomum iners* is found in Malaysia in great abundance, in Ceylon and the Malay Peninsula, whereas *Cinnamomum obtusifolium* thus far is reported only from India and China.

The leaves of *C. iners* are frequently pubescent on the lower surface. In *C. obtusifolium* they are glabrous or glabrescent, and are larger and much coarser in texture than those of the former. The greatest difference, however, occurs in the inflorescence. *Cinnamomum iners* has axillary and subterminal panicles, for the most part not exceeding the leaves, while in *C. obtusifolium* the very numerous panicles are usually subterminal, and usually exceed the leaves. The flowers of *C. iners* are small, the lobes are triangularly ovate, nearly as broad as long, with dense sericeous pubescence, completely covering the outer surface. The flowers of *C. obtusifolium* are much larger, the lobes ovate, longer than broad, with sparse short grayish pubescence, the tips of the lobes nearly glabrous. The peduncles of the inflorescence of

C. obtusifolium are heavier and coarser than those of *C. iners*. The fruit of *C. iners* is up to 8 cm. long, ellipsoid, acutish at apex, apiculate. The calyx-lobes are slightly enlarged, persistent and spreading. The fruit of *C. obtusifolium* measures about 1 cm. in length, is oblong-ellipsoid, rounded at apex and apiculate. The calyx-lobes are considerably enlarged, caducous at the midpoint, the remainder forming a shallow cupule with deeply scalloped margin.

Cinnamomum Fargesii Lecomte in Nouv. Arch. Mus. Hist. Nat. Paris, sér. V, **5**: 78. 1913; Liou, Laurac. Chine Indoch. 40. 1932.

DISTRIBUTION: known only from type locality.

CHINA. S z e c h u a n : *P. Farges 1064* (holotype, Paris; photo. and fragm. AA).

A species apparently transitional between *Cinnamomum* and *Neocinnamomum*. The flowers definitely show the structure of the former, while the leaves recall those of the latter genus. The fruit, as yet, is unknown (see discussion below under *Neocinnamomum*).

Neocinnamomum Liou, Laurac. Chine Indoch. 82. 1932.

The question has arisen recently of whether or not Liou's generic segregate from *Cinnamomum* should stand. With the exception of one little-known species, i.e. *C. Fargesii*, the line of demarcation is clear cut.

The members of *Neocinnamomum* have leaves that are tri- or triplinerved; the inflorescences are pedunculate or consisting of sessile glomerules crowded into leaf axils; the flowers are unisexual, with nine fertile stamens with anthers having four cells, all in the same plane. Other differences mentioned by Liou, and apparent on examination, mark the genus. The most important, however, is the plane of the cells. Some species of the genus have heretofore been confused with *Cinnamomum Fargesii* and with *Lindera*.

Neocinnamomum hainanianum, spec. nov.

Frutex 3 m. altus, ramulis brunneo-pubescentibus teretibus striatis. Folia alterna, membranacea, late ovata, 8–10 cm. longa, 4–7 cm. lata, acuminata, basi cuneata subtruncatave, supra venis exceptis glabriuscula, subtus brunneo-pubescentia, subtriplinervia, petiolis 1–1.5 cm. longis brunneo-pubescentibus. Inflorescentia axillaris solitaria brevipedunculata. Flores ignoti. Fructus ovoideus, usque ad 2 cm. longus, 1.5 cm. in diam., calyce crasso hypocrateriforme 12 mm. lato, pedicello incrassato usque ad 1 cm. longo, lobis persistentibus incrassatis carnosis marcidis.

DISTRIBUTION: Hainan.

CHINA. H a i n a n : Loktung, *S. K. Lau 26781,* May 17, 1936, shrub 3 m. high, diam. 3 cm. (AA).

The first time this genus has been reported from Hainan. The species is similar to *Neocinnamomum Lecomtei* Liou from Tonkin. It is easily distinguished, however, by the pubescence on the leaves and branches.

Neocinnamomum Wilsonii, spec. nov.

Litsea fruticosa Gamble in Sargent, Pl. Wilson. **2**: 77. 1914, p.p.

Arbor parva vel frutex 2–7 m. altus, ramulis glabris teretibus striatis brunneis maculosis. Folia alterna, membranacea, late ovata rhomboideave, 4–6 cm. longa, 3–4 cm. lata, acuminata a basi varie cuneata, supra conspicue reticulata, glabra, margine supra medium, leviter undulato, trinervia, petiolo gracili, 0.5–0.7 cm. longo, glabro. Inflorescentia axillaris solitaria, subsessilis, subumbellata, pauciflora. Flores 1–3, circa 2 mm. longi, pedicello gracili usque ad 4 mm. longo, lobis 6, 3 interioribus extus pubescentibus, antherae loculis 4, in uno plano, 2 lateralibus, 2 extrorsis introrsisve. Fructus globosus usque ad 11 mm. in diam., calyce crasso hypocrateriformi, 5 mm. lato, pedicello leviter incrassato usque ad 1 cm. longo, lobis persistentibus marcidis.

DISTRIBUTION: western and central China.

CHINA. S z e c h u a n : *W. P. Fang 5664;* Taning Hsien, alt. 2-3000 ft., *E. H. Wilson 4587,* 1910, bush 12 ft., (holotype, AA). H u p e h : *H. C. Chow 509.*

There is no species of *Cinnamomum* with which this species may be confused. It is unique also in *Neocinnamomum.* However, it has been determined and treated variously as *Lindera*[1], *Litsea,* and finally by Liou as *Cinnamomum Fargesii.*

HERBARIUM, ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

[1]Allen, Ann. Missouri Bot. Gard. **25**: 399. 1938.

NEW AND NOTEWORTHY SPECIES OF ASIATIC JASMINUM

CLARENCE E. KOBUSKI

Jasminum (§Unifoliolata) **albicalyx,** spec. nov.

Frutex scandens ramulis pubescentibus. Folia opposita vel subopposita, simplicia, membranacea, sparse pubescentia, saepe in axillis nervorum barbata, ovata, 6–9 cm. longa, 3–4.2 cm. lata, basi subrotundata vel cuneata, apice acuta, subtus albida, costis venisque elevatis, petiolis 2–4 mm. longis. Inflorescentia cymosa, triflora, subsessilis, duobus paribus bractearum anguste linearium 6–8 mm. longarum suffulta. Calyx albidus, puberulus, tubo 2 mm. longo, lobis 5–6 subulato-setaceis 6–9 cm. longis. Corolla alba, tubo 14 mm. longo, lobis 5, ca. 5 mm. longis ovatis acuminatis. Fructus ignotus.

KWANGSI: Yung Hsien, Ch'ang An, over rocks in forest, alt. 200 m., *A. N. Steward & H. C. Cheo 1172,* (TYPE AA) Oct. 23, 1933 (vine with white flowers).

This unusual species is characterized by its three-flowered cyme in which the calyces are white or yellowish white. The flowers are subsessile or nearly so, subtended by two pairs of bracts with the upper pair of bracts occasionally longer than the lower pair. The leaves are dull green in some cases and gray-green in others. The midrib and veins are elevated on the lower surface, and white or yellowish white. Scattered pubescence is found on the lower surface, often in clusters in the axils of the lower veins. The branchlets and often the leaves are not always truly opposite, as is usually the case in the section Unifoliolata.

Jasminum (§Unifoliolata) **cinnamomifolium,** spec. nov.

Frutex scandens, 1–2 m. altus, glaber, ramulis gracilibus teretibus. Folia opposita, simplicia, coriacea, oblong-lanceolata, 7–10 cm. longa, 2–3 cm. lata, basi late cuneata, raro subrotundata, apice acuminata, supra viridia, subtus paullo pallidiora, trinervia, nervis duobus lateralibus e basi ad medium rectis, supra undulatis; petioli 7–10 mm. longi. Inflorescentia triflora in apice ramulorum, 1 vel 2 paria foliorum et basin versus 1 vel 2 paria bractearum minutarum gerentium; calyx glaber, tubo gracili, ca. 3 mm. longo, lobis 5, subulato-setaceis ca. 2 mm.

longis; corolla alba, tubo ca. 1 cm. longo, lobis 9 lineari-lanceolatis ca. 3 cm. longis, 1.5–2 mm. latis. Fructus in sicco flavescens (viridis ex collectore) carpidio solitario late ovoideo 10–11 mm. longo et 9–10 mm. lato.

HAINAN: Kumyun, on slope in dense woods, *S. K. Lau 27620* (TYPE AA), Aug. 6, 1936 (scandent, twining, 1 m. high; leaves green above; fruit green). — Loktung, in dense woods, *S. K. Lau 27106,* June 12, 1936 (climbing, 2 m.; leaves green above; flowers yellowish white).

Jasminum cinnamomifolium is characterized by three-nerved, coriaceous, oblong-lanceolate leaves, flowers in threes and solitary fruits. In the leaves, the two main lateral veins begin at the base and curve evenly along the margin for the basal half of the leaf. In the upper half, these same veins become somewhat undulate upon being joined by less conspicuous cross-veins. The flowers, in clusters of threes, terminate axillary branchlets. On these branchlets occur either a single or two pairs of leaves plus one or two pairs of minute bracts. In *Lau 27105* (flowering specimen), these leaves are like the main stem leaves in size and shape (7–10 cm. long, 2–3 cm. wide). However, in *Lau 27620* (fruiting specimen), these branchlet leaves, although similar in shape are considerably smaller (2.7–3.5 cm. long, 0.85–1.0 cm. wide).

This species is closely related to *J. urophyllum* Hemsley but can be easily separated by the subulate-setaceous calyx-lobes. In *J. urophyllum* the calyx-lobes are very short and acute.

Another closely allied species is *J. laurifolium* Roxb. This species can be separated from *J. cinnamomifolium* by its narrower, heavy coriaceous leaf with revolute margin. Because of the heavier texture of the leaf, the two main lateral veins are obscured while the midrib is most outstanding. The flowers, in both species, are in threes. In *J. laurifolium* the three pedicels of the flowers are joined to a common peduncle. In the present species, there is no peduncle.

The following specimen, *C. W. Wang 72764,* collected in Yunnan at Chen-Kang Hsien, in March 1936 at an altitude of 1400 m. undoubtedly belongs to this species. It is a rather wretched specimen consisting of two detached leaves and a single unopened flower. However, these same leaves, such as they are, and the single flower, along with the terminal floral arrangement of the specimen are enough to show that it belongs with this species. This specimen was not used in compiling the original description because of its fragmentary nature and its origin (Yunnan). Before citing Yunnan as a record of spontaneous growth, better specimens should be collected.

Jasminum cinnamomifolium Kobuski var. **axillare**, var. nov.

A typo differt floribus axillaribus, calycis lobis longioribus (4–16 mm.).

YUNNAN: Chen-Kang Hsien, ravine, alt. 2000 m., *C. W. Wang 72170*, March 1936 (vine with greenish yellow flowers). — Chen-Kang Hsien, ravine, alt. 1600 m., *C. W. Wang 72261* (TYPE AA), March 1936 (flowers white). — Keng-Ma, woods, alt. 1600 m., *C. W. Wang 72830*, Apr. 1936 (vine with greenish white flowers). — Fo-Hai, mixed forest, alt. 1550 m., *C. W. Wang 73847*, May 1936 (vine with greenish yellow fruit). — Keng-Ma, ravine, alt. 1670 m., *C. W. Wang 72892*, Apr. 1936 (vine with white flowers). — Nan-Chiao, forest on mountain slope, alt. 1350 m., *C. W. Wang 75013*, June 1936 (vine with green fruit). — Lan-Tsang Hsien, ravine, alt. 1600 m., *C. W. Wang 76498*, May 1936 (vine with green fruit).

The chief differences of this variety from the species are the axillary flowers and the elongated calyx-lobes. The lobes of the species measure approximately 2 mm. long. In the variety calyx-lobes varied from 4–6 mm. found in *Wang 75013, 72830* and *72170* to 12–16 mm. found in *Wang 72261* and *73847*. In the species the flowers are found in threes and always terminating axillary flower branchlets. In the variety, the flowers are usually solitary and confined to the leaf axils.

Jasminum laurifolium Roxburgh, Hort. Bengal. 3. 1814, nom.; Fl. Ind. **1**: 91. 1821. — DeCandolle, Prodr. **8**: 303. 1844. — Kurz, For. Fl. Brit. Burma, **2**: 152. 1877. — C. B. Clarke in Hooker f., Fl. Brit. Ind. **3**: 597. 1882. — Kobuski in Sunyatsenia, **3**: 110. 1936.

Jasminum angustifolium Ker in Bot. Reg. **7**: t. 521. 1821, non Willd.

Jasminum angustifolium Ker var. *β laurifolium* Ker in Bot. Reg. **7**: t. 521. 1821.

KWANGSI. Shap Man Taai Shan: near Iu Shan village, s.e. of Shangsze, Kwangtung border, fairly common in dry, silt or sandy soil, *W. T. Tsang 22194*, May 3, 1933 (scattered shrubs, 1 m. with fragrant white flowers). — near Hoh Lung village, s.e. of Shang-sze, Kwangtung border, in dry steep slope of silt and solid rock, *W. T. Tsang 22498*, June 18, 1933 (fairly common shrub 1 m. high with blue-black fruit). — Tang Lung village, s.e. of Shang-ze, Kwangtung border, in thicket, *W. T. Tsang 24259*, September 14, 1934 (fairly common climber 1.5 m. high; fruit bluish black). — Hainan: Mo San Leng, in forest, alt. 900 m., *N. K. Chun & C. L. Tso 44306*, Nov. 1932 (bushy shrub 1–1.5 m. high).

In 1936, *Jasminum laurifolium* Roxburgh* was reported from China, probably for the first time. Since then three more collections have come to the attention of the author, two from Kwangsi and one from Hainan. Formerly this handsome shrub was known only from India.

Kurz in For. Fl. Brit. Burma says that the fruit is above 1/3 inch long. This is the only reference to fruit size that I have been able to find in literature. The Hainan specimen collected by Chun & Tso possesses a single fruit, broadly oblong measuring 18 mm. × 11 mm. This is much larger than fruit cited by Kurz, in fact, the largest fruit I have ever seen in the genus *Jasminum*. Since only a single specimen is available, I have hesitated to examine it other than externally and to make measurements hoping for future specimens to make sectional examination. Also it appears from this meagre specimen that the inflorescence is one-flowered rather than three-flowered as is the typical case.

Kurz in speaking of the leaves says, "leaves linear to linear-lanceolate, rounded or acute at the base, on a 2 lin. long petiole jointed at the middle, 2–5 in. long, bristly acuminate, entire, glabrous, thinly coriaceous, the lateral nerves thin and uniting from the base into a more or less distinct intramarginal nerve and without any net-veination between them." *Tsang 24259* possesses larger leaves (up to 10 cm. long, 3.1 cm. wide) than the other cited specimens (up to 6.0 cm. long, 1.8 cm. wide). Also *Tsang 24259* instead of being 3-nerved is several-nerved. The two basal lateral nerves run parallel to the margin. Besides these, are usually 2 more pairs of veins also parallel beginning further up the midrib. These veins do not join with the outer veins as cross-veins. In the other cited specimens are found obscure cross-veins which occasionally join with the marginal parallel veins making the latter somewhat undulate. In some leaves the veining is similar to *Tsang 24259* and in other cases as obscure as those mentioned by Kurz.

Jasminum (§Unifoliolata) **pericallianthum**, spec. nov.

Frutex scandens glaber. Folia opposita, simplicia, coriacea, oblongo-ovata, 11–17 cm. longa, 4–6.5 cm. lata, basi cuneata vel subrotundata, apice acuminata, costis venisque subtus elevatis, petiolis 8.0–8.5 mm. longis. Inflorescentia axillaris, laxe cymosa, 6–12-flora; calyx glaber, tubo 2.5–3 mm. longo in pedunculum incrassatum 8–8.5 mm. longum attenuato, lobis 5 brevibus acutis ca. 0.5 mm. longis. Corolla nivea (5 cm. diametro ex collectore), tubo gracili 3.5–4 cm. longo, apice ampliore, lobis 5 ovatis ca. 2 cm. longis 1.0–1.4 cm. latis. Fructus ignotus.

*Kobuski in Sunyatsenia, 3: 110. 1936.

BURMA: hills east of Fort Hertz, alt. 1200 m., *F. Kingdon Ward 9078*, Dec. 30, 1930 (magnificent twining climber in the jungle; flowers snow white, fragrant, 2 inches across, tube 1 3/4 inches).

"A magnificent twining climber in the jungle." In his field-notes, F. Kingdon Ward makes this memorandum. On looking at the specimen, one can readily see why he so describes it. With flowers, equalled by no *Jasminum* ever studied by the author, this species is probably one of the most beautiful in the genus. Loose cymes of snow-white fragrant flowers which easily measure two inches across the corolla-lobes, and corolla tubes nearly two inches in length are outstanding characters of the species. Also the stocky thickened pedicels which enlarge starting from the base until nearly of the same size as the calyx-tube with scarcely any constriction at this point offer another interesting specific distinction.

Jasminum (§Unifoliolata) **pilosicalyx**, spec. nov.

Frutex scandens ramulis dense pilosis. Folia opposita, simplicia, papyracea, ovato-elliptica, 8.5–11 cm. longa, 5–7.5 cm. lata, basi subcordata vel subrotundata, apice obtusa subito acuminata, margine ciliata, costa venisque subtus pilosis, petiolis 7–9 mm. longis. Inflorescentia axillaris, cymosa triflora. Flores immaturi. Calyx dense pilosus, tubo 1–1.5 mm. longo, lobis 5 subulato-setaceis 5-6 mm. longis. Fructus ignotus.

HAINAN: Po-ting, in forest, alt. 400 m., *F. C. How 73094*, July 5. 1935 (bark gray; leaves green above, pale green beneath; calyx with white pubescence).

A pubescent calyx in the genus *Jasminum* is no novelty. However, the white pilose pubescence of *J. pilosicalyx* is the most distinctive calyx pubescence seen in any species of the genus. This white pilosity may exist only in the early flowering stage since the stems and leaves are also pilose but of a more nearly tan color. Since only a single immature flower can be found on How's specimen, it is difficult to obtain any true concept of the corolla's ultimate proportion. The papyraceous, ciliate leaves are other distinctive features of the species.

Jasminum (§Unifoliolata) **Rehderianum** Kobuski in Sunyatsenia, **3**: 110. 1936.

This outstanding species is confined so far as known at present to Hainan. It has been collected four times from this region, twice by *H. Y. Liang* (*62844, 62986*) in September 1933, once by *C. Wang* (*33768*) in August 1933 and finally by *C. I. Lei* (*1456*) in August 1934.

Lei remarks that it is found abundantly in the Lam ko district and vicinity on dry gentle slopes, in sand and on rocky seashore.

Jasminum (§Unifoliolata) **robustifolium,** spec. nov.

Frutex scandens robustus glaber. Folia opposita, simplicia, coriacea, oblongo-ovata, basi cuneata vel subrotundata, apice acuminata, 10–22 cm. longa, 5–9.3 cm. lata, venis lateralibus ad costam perpendicularibus, petiolis robustis 2–2.5 cm. longis, ad 2 mm. latis. Inflorescentia paniculata, axillaris. Flores ignoti. Fructus cinnabarinus (ex collectore) unicus visus carpidio uno tantum ovato 13–15 mm. longo 7–10 mm. lato.

YUNNAN: Tsang-Yuan, ravine, alt. 1200 m., *C. W. Wang 73304,* Apr. 1936 (vine with orange-red fruit) (AA).

Closely allied to *J. Wangii,* but separated easily by its paniculate inflorescence and leaves with nearly perpendicular rather than acutely angled veining. This species is very outstanding in the genus because of its very large leaves and generally robust stature. In China, its nearest ally in size is *J. coffeianum* Hand.-Mazz. However, again its paniculate inflorescence separates the two. Also, the leaves in *J. coffeianum* are more coriaceous.

Jasminum (§Unifoliolata) **Wangii,** spec. nov.

Frutex scandens glaber, ramulis minutissime glandulosis. Folia opposita, simplicia, coriacea, oblongo-ovata, 15–26 cm. longa, 6.8–10.3 cm. lata, decidua, basi cuneata vel subrotundata, apice subito acuminata, venis subangulo acuto divergentibus, petiolis ca. 2 cm. longis. Inflorescentia racemosa, terminalis axillarisque, pedicellis pedunculisque glandulis minutissimis dense dispositis. Calyx glaber, pedicello 1.5–2.5 cm. longo, tubo ca. 3 mm. longo, lobis 5 acutis parvis ca. 5 mm. longis; corolla alba, tubo gracili 2–2.5 cm. longo, lobis 6–7 lineari-lanceolatis vel ovatis, 10–11 mm. longis, plerumque 2–2.5 mm. latis. Fructus ignotus.

YUNNAN: Sheou-bang-chou-chian, Che-li Hsien, woods in mountainous ravine, alt. 900 m., *C. W. Wang 79673* (TYPE AA), Sept. 1936 (leaves light green underneath; flowers white). — Kuen-ger, Che-li Hsien, in mixed forest, alt. 1000 m., *C. W. Wang 79217,* Oct. 1936 (vine 2 m. long; flowers white). — Jah-leei, Che-li Hsien, in mixed forest, alt. 1400 m., *C. W. Wang 79151,* Oct. 1936 (climber in forest with white flowers).

Jasminum Wangii closely resembles *J. robustifolium* from which it is easily separated by the racemose inflorescence, veins at an acute angle and by the dense covering of minute glands on the young branches

and pedicels of the inflorescence which can be seen only under a high-powered binocular. On the very young growth, especially in the inflorescence, these glands are colored orange-brown, fading either by drying or by maturity to brown. On the most mature portions of the specimen these glands fade out entirely. Compared with the usual subulate-setaceous or foliaceous calyx-lobes, generally found in the genus, the lobes of this species seem quite reduced. The corolla lobes of *Wang 79151* differ from the other two specimens cited in being ovate (5 mm. wide) rather than linear-lanceolate (2–2.5 mm. wide). In this specimen, however, there are only two flowers and of these only one had opened.

Jasminum (§Trifoliolata) **anisophyllum**, spec. nov.

Frutex (probabiliter scandens) 3 m. altus, fere undique dense pilosus, ramulis floriferis teretibus. Folia opposita, membranacea, trifoliata, foliolis valde inaequalibus, terminali oblongo-ovato, basi subcordato vel rotundato, apice acuminato, 8.5–10.5 cm. longo, 4–4.8 cm. lato, venis primariis lateralibus 4–5, costa supra impressa subtus elevata, petiolulo 2.5–3 mm. longo, lateralibus multo minoribus ovatis, ca. 1.4 cm. longis, 7 mm. latis, sessilibus vel subsessilibus; petiolis 2–3 mm. longis. Inflorescentia axillaris cymosa. Calyx dense pilosus, tubo 3–4 mm. longo, lobis 5 subulato-setaceis ca. 2 mm. longis. Corolla alba, tubo gracili ca. 2 cm. longo, lobis (5 ?) linearibus, 5–8 mm. longis, ca. 2 mm. latis. Fructus ignotus.

YUNNAN: You-louh shan, Che-li Hsien, mixed forest, alt. 1150 m., *C. W. Wang 78119*, Sept. 1936 (height 3 m.; flowers white).

Jasminum anisophyllum, *J. sinense* and *J. Forrestianum* are closely joined in a small distinctive group. The main distinction of this group is based on the lateral leaflets being markedly smaller than the terminal leaflet. In *J. anisophyllum* these lateral leaflets are minute in comparison with those of the other two mentioned species. In fact, the contrast between the terminal and lateral leaflets is so great that the laterals at first glance are generally mistaken for bracts. Also the lateral leaflets are sessile or subsessile in *J. anisophyllum* and the petiolule of the terminal leaflet measures only 2–3 mm. Both these measurements are far lower than those of the other two species. The corolla-tube in *J. anisophyllum* measures approximately only 2 cm. long. Corolla-tubes of *J. sinense* can be found measuring up to 4 cm. The pilose pubescence is another outstanding feature of *J. anisophyllum*. This pubescence exists over the whole plant and is most pronounced on the midrib and veins of the leaves and on the calyx.

Jasminum (§Trifoliolata) **Forrestianum**, spec. nov.

Frutex scandens glaber, 2.5–6 m. altus ramulis floriferis angularibus vel sulcatis. Folia opposita, trifoliata vel simplicia, coriacea vel subcoriacea, foliolis inaequalibus, terminali oblongo-ovato, basi truncato vel subcordato, apice acuminato, 6–13 cm. longo, 3.3–6.2 cm. lato, costa supra impressa, subtus elevata, petiolulo 1.2–2 cm. longo, lateralibus minoribus ovatis, basi obliquis, apice acuminatis, ca. 3.5–6 cm. longis, 1.9–3 cm. latis, petiolulis 1.5–2 mm. longis, petiolis 1.3–2 cm. longis. Inflorescentia cymosa vel subpaniculata, axillaris. Pedicelli 5–6 mm. longi. Calyx glaber, tubo 1.5–2 mm. longo, lobis 5 minutissimis triangularibus vix 0.5 mm. longis. Corolla extus rosea vel pallide purpurea, intus cereo-alba, tubo 1.2–1.5 cm. longa, lobis 5 ovatis 7–9 mm. longis ca. 6 mm. latis. Fructus (atrovirens, ex collectore) in sicco flavescens, carpellis duobus vel solitariis, late globosis, ovoideis vel subrotundatis, ca. 10 mm. longis.

YUNNAN: Flanks of the Mingkwong Valley, on trees and shrubs, lat. 25° 15′ N., alt. 2135 m., *G. Forrest 7861* (TYPE AA), May 1912 (scandent shrub 2.5–6 m.; flowers interior waxy white, exterior flushed crimson-rose, deliciously fragrant). — Precise locality and date lacking, *G. Forrest 9811*. — Chen-Kang Hsien, alt. 2800 m., *C. W. Wang 72464*, March 1936 (climbing; flowers light purple). — Chen-Kang Hsien, alt. 2600 m., *C. W. Wang 72462*, March 1936 (fruit green). — Lung-ling Hsien, along stream, alt. 2200 m., *H. T. Tsai 55006*, Jan. 7, 1934 (climbing shrub with green to black fruit). — Lung-ling Hsien, in forest, alt. 1800 m., *H. T. Tsai 55745*, Apr. 11, 1934 (climbing shrub with dark purple fruit). — Shang-pa Hsien, in ravine, alt. 2000 m., *H. T. Tsai 54520* (twining shrub). — Locality and date lacking, *H. T. Tsai 57012*.

Jasminum sinense is the closest relative of this species and may be easily separated by its long graceful corolla-tubes (up to 4 cm.), slender corolla-lobes and subulate-setaceous calyx-lobes. In *J. Forrestianum* the corolla-tubes are less graceful and measure only up to 1.3 cm.; the corolla-lobes are much broader and the calyx-lobes are small. Also the stamens are clearly exserted while in *J. sinense*, the stamens are inserted.

From *J. anisophyllum*, another close relative, it can be separated by its glabrous, long-petioled leaves, longer petiolulate lateral leaflets, small calyx-lobes and furrowed flowering branches.

This species naturally falls in the section Trifoliolata because of its usually trifoliolate leaves. Occasionally, specimens are found which

are unifoliolate (*Forrest 9811, Tsai 54520, 55745*). However, *Tsai 54520,* for example, even though mostly simply leaved, has occasional trifoliolate leaves. Since the specimens cited above agree in all other features, it seems undesirable to separate them on this variable character.

The veins are distinctly impressed on the upper surface and elevated on the lower surface. Also the lateral veins sweep upward near the margin and join with the veins immediately above, thus making an undulating marginal vein.

Jasminum Forrestianum is named after that indefatigable botanical collector, the late George Forrest, to whom we owe so much of our knowledge of the extremely rich flora of western China and the adjoining regions.

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BOTANICAL RESULTS OF THE ARCHBOLD EXPEDITIONS NEW GUINEA RECORDS OF ANNONACEAE AND MENISPERMACEAE

L. Diels

MENISPERMACEAE

Tinospora polygonoides Diels, Pflanzenreich **46(IV.94)**: 136. 1910.

Petala nonnunquam aliquanto maiora, ad 4 mm. longa, 2.5 mm. lata.

Mabaduan, Western Division, *L. J. Brass 6501, 6477.* — Tarara, *L. J. Brass 8541.*

Known only from New Guinea.

Hypserpa laurina (F. Muell.) Diels, Pflanzenreich **46(IV.94)**: 209. 1910.

Sepala intima maiora, 5-nervosa.

Lower Fly River, east bank, opposite Sturt Island, rain forest, large liana of ridges, climbing by tendrillate branches with or without leaves, flowers green, fruits red, Oct. 1936, *L. J. Brass 7995.* — Tarara, Wasi Kussa River, Western Division, *L. J. Brass 8736.*

The first record of this species outside N. E. Australia.

Sarcopetalum Harveyanum F. Muell. Pl. Vict. **1**: 27, 221, suppl. pl. 3. 1860–1862; Diels, Pflanzenreich **46(IV.94)**: 252. 1910.

Endocarpium 4–6 mm. longum, 5–7 mm. latum ideoque plerumque quam illud formae typicae (3–3.5 mm. longum, 4–4.5 mm. latum) conspicue amplius, tuberculis maioribus fere aculeolatum.

Lake Daviumbu, Middle Fly River, rain forest, common twiner ascending substage trees, infl. lateral, on lower stem, fr. soft, red, 6–8 mm. diam., Sept. 1936, *L. J. Brass 7714.* — Tarara, Wassi Kussa River, Western Division, small climber common in rain forests, Jan. 1937, *L. J. Brass 8659.*

The first record of this monotypic genus outside N. E. Australia. The New Guinean specimens agree completely with those of Australia; only the endocarp is somewhat larger.

ANNONACEAE

Uvaria micrantha (A. DC.) Hook. f. et Thoms. Fl. Ind. **1**: 103. 1855; Hook. f., Fl. Brit. Ind. **1**: 51. 1872.

Guatteria micrantha A. DC. Mém. Fam. Anon. 42. 1832.

Tarara, Wassi Kussa River, Western Division, rain forest, liane, fls. purple-brown, Jan. 1937, *L. J. Brass 8557.* — Kanosia, forest on edge of mangrove swamps, sea level, ca. 8 feet tall, calyx brownish-olive,

corolla brown, Feb. 2, 1935, *C. E. Carr 11088.* — Lolorua, forest, ca. 100 feet, climber, fruit orange, Feb. 24, 1935, *C. E. Carr 11509.*

The species is distributed from Further India and Sumatra to the Philippines. First records for New Guinea.

Rauwenhoffia Leichhardtii (F. Muell.) Diels, comb. nov.

Unona Leichhardtii F. Muell. Fragm. **3**: 41. 1842.

Melodorum Leichhardtii Benth. Fl. Austr. **1**: 52. 1863; Bailey, Queensl. Flora **1**: 25. 1899.

Rauwenhoffia uvarioides Scheffer, Ann. Jard. Buitenz. **2**: 23. 1885; Diels, Bot. Jahrb. **44**: 125. 1912.

Uvaria lutescens K. Schum. in K. Schum. & Hollr., Fl. Kaiser-Wilhelmsl. 48. 1889; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Süds. 315. 1901.

Lake Daviumbu, Middle Fly River, large climber, common in rain forest canopy, Aug. 1936, *L. J. Brass 7584;* same locality, flowers yellow-brown, sweet-scented, Sept. 1936, *L. J. Brass 7681.* — Lower Fly River, east bank opposite Sturt Island, rain forest, common high climbing liane on ridges, fruit orange-brown, Oct. 1936, *L. J. Brass 7993.*

Mitrephora Versteegii Diels, Bot. Jahrb. **44**: 153. 1912.

Southeast New Guinea: Palmer River, two miles below junction Black River, common in rain forest substage 100 m. alt. slender tree attaining 8–9 m., numerous golden-yellow flowers in lateral fascicles on old wood, July 1936, *L. J. Brass 7311.*

Orophea rhytidocarpa Diels, n. sp.

Arbor ex coll. parva circ. 3 m alta. Rami juniores pilosi. Foliorum petiolus crassus brevis 0.3–0.4 cm. longus, pilosus, lamina papyracea, glabra, lineari-lanceolata, apicem versus sensim longe angustata, apice ipsa obtusiuscula, basi subobliqua, 30–35 cm. longa, 6–6.5 cm. lata, nervi laterales primarii 12–15 a costa abeuntes, supra inconspicui, subtus prominuli. Pedunculi axillares, longissimi, penduli. Carpidia pauca (2 ?), breviter (circ. 3 mm.) stipitata, divaricata, subglobosa, dense velutinella, viridia, costulis irregulariter reticulatis conspicue rugosa, viva ex coll. 2.5 cm., sicca circ. 2 cm. diam.

Fly River: 528 mile Camp, forest undergrowth, on ridges, alt. 80 m., small sparsely branched near-tree 3 m. high, leaves secund, a solitary 2-lobed rugose green fruit on a long axillary peduncle (lobes of fruit 2.5 cm. diam.) May 1936, *L. J. Brass 6736.*

Near *O. dolichonema* Diels from N. E. New Guinea, but differs in the narrower leaves, the more distant nerves, hardly connected at the margin, and the ripe, strongly corrugated carpels.

Botanical Museum
Berlin-Dahlem, Germany.

BOTANICAL RESULTS OF THE ARCHBOLD EXPEDITIONS NEW AND NOTEWORTHY PAPUAN SCROPHULARIACEAE. II.

Francis W. Pennell

Through the kindness of Dr. E. D. Merrill of Harvard University there has been submitted for my study a further series of specimens collected in Papua by Mr. L. J. Brass, under a second expedition conducted to that little-known country by Mr. Richard Archbold in association with the American Museum of Natural History. Most of these were gathered between September and November, 1936 along the lower and middle course of the Fly River. This, the largest stream in New Guinea, lies in western Papua and so about the middle of the southern side of the island. This portion of New Guinea is situated just opposite Cape York, which terminates the northeastern extension of Queensland, and thus is geographically not far away from the Australian continent. For a map of this region see Jour. Arnold Arb. **19**: 174. 1938.

The plants gathered are all from low altitudes. In my previous paper[1] I stressed the sharp contrast between the lowland and highland Scrophulariaceae in New Guinea, a difference which had been noticed earlier by Dr. Schlechter. Among the earlier Archbold collections only a specimen of *Buchnera* had appeared out of its expected elevation, but Mr. Brass has since assured me that there had been an error in transcribing his record of altitude, for the specimen actually came from 1500, and not 2840 meters above the sea.[2] The plants of the second collection are all characteristic members of the lowland scrophulariaceous flora.

Some of these plants are widespread Indo-Malayan species, adding more representatives of the class that was so dominant in the former series of Archbold Papuan plants. Among those now first reported the most striking is *Artanema longifolium,* of which I have seen no previous record from east of Wallace's Line. But others are species long known from tropical northeastern Australia, where there exists a small group of supposedly endemic members of the family. Probably all of these

[1]Brittonia **2**: 177-188. 1936.
[2]Correction made in Brittonia **3**: 95. 1938.

will prove to be present also in southern New Guinea, since otherwise Australia is nearly lacking in Scrophulariaceae. To the extensive number of Indo-Malayan plants of this family, which have clearly extended eastward as discussed in my preceding paper, should be added this smaller group of Austro-Malayan plants, a group that must prove to be ultimately, though more remotely, also of Indo-Malayan origin.

As so little is known of the flora of the Fly River valley it seems worthwhile to record all the species of this small collection of Scrophulariaceae. As in the previous list, they are inserted under the generic and specific numbers of Schlechter's "Die Scrophulariaceen Papuasiens,"[3] and the species and genera now first reported from New Guinea are noted by an asterisk. The addition of these makes a new total for the island of 28 lowland and 13 alpine species of Scrophulariaceae, but I confidently expect to see this proportion reversed when more of the difficult mountain areas have been botanically explored.

1. **Limnophila** R. Br.

3. **L. aromatica** (Lam.) Merr. Interpret. Rumph. Herb. Amb. 466. 1917.

Lake Daviumbu, Middle Fly River, plentiful in grassy shallows of swamps and lagoons, *Brass* 7532; flowers puce-colored.

2. **Adenosma** R. Brown

To the two species enumerated by Schlechter is to be added the following, remarkable for its ternate instead of opposite phyllotaxy. It seems to be akin to both *A. coeruleum* R. Br.[4] and *A. papuanum* Schlechter, resembling them in habit, but differing in ternate phyllotaxy, lack of glandularity, inflorescence more spike-like, its upper sepal less conspicuously enlarged, its upper corolla-lobes distinct at apex, and its seeds narrower. It further differs from current descriptions of *Adenosma* in the hairiness of the landing-stage of the lower lip, but this is likely to prove an overlooked generic character.[5] Of course such hairs are part of the floral mechanism, helping the bee to alight on the expanded lower lip and so to enter the flower in erect posture.

[3]Bot. Jahrb. **59**: 99-117. 1924.

[4]R. Brown, Prodr. 1: 442. 1810. Figured in Banks and Solander, Illustr. Bot. Cook's Voy. **2**: *t. 218*. 1901, and described in the accompanying text (p. 66).

[5]Although its localization was not realized, this hairiness was evidently meant by the phrase "tubus . . . interne pilosiusculus" in the description accompanying Banks and Solander's plate.

*3. **A. ternatum** Pennell, sp. nov.

Herba perennis (?), 5–10 dm. alta, ramosa; caulis et rami teretiusculi, hirsuti, eglandulosi; folia ternata, petiolata, triangulari-ovata, obtusa, basi cuneata, margine crenato-dentata, utrinque hirsuto-pubescentia, lamina 2–2.5 cm. longa, infra medium 1.5–2.3 cm. lata, petiolo 4–9 mm. longo; flores inferiores plus minusve remoti, alii in racemum spiciformem congesti; bracteolae duae, lineares, calyce breviores; sepala inaequalia, lanceolata vel lineari-lanceolata, 4–6 mm. longa; corolla 10 mm. longa, tubulosa, bilabiata, violaceo-caerulea, extus glabra, labio supero apice bifido, labio infero villoso, trilobato, lobis retusis; stamina 4, glabra, inclusa, filamentis inferis longioribus, connectivis globosis, et antherarum superarum cellulis aequalibus, sed inferarum uno rudimento inaequalibus; capsula 7–8 mm. longa, nigra, latere ad septum sulcata, loculicida et tardius etiam septicida; semina 0.4 mm. longa, cylindrica, rugoso-reticulata.

Herb apparently perennial,[6] 5–10 dm. tall or more, short-branched above, hirsute throughout but not glandular. Stem and branches teretish, laxly or densely foliate. Leaves ternate, petiolate, triangular-ovate (wider than in *A. coeruleum*), obtuse, at base cuneate, margin crenate-dentate, hirsute-pubescent on both surfaces or beneath, mainly so on the prominent veins, blades 2–2.5 cm. long, below the middle 1.5–2.3 cm. wide, petiole 4–9 mm. long. Lower flowers somewhat isolated, the upper forming a short spike-like raceme; lower bracts leaf-like, upper oblanceolate, about equaling the sepals. Pedicels 1–2 mm. long. Bractlets 2, linear, shorter than the calyx. Sepals unequal, lanceolate or linear-lanceolate, 4–6 mm. long. Corolla 10 mm. long, tubular-bilabiate, violet-blue (without record of pattern), externally glabrous; upper lip projecting-arched, its lobes rounded, distinct at apex;[7] lower lip 2-ridged and villose, distally with three retuse lobes. Filaments four, included, glabrous, the anterior pair slightly longer; connective knob-like; postero-laterals with two nearly equal anther-cells, antero-laterals with only one anther-cell, the other a mere rudiment. Stigmas wide, plate-like, or perhaps arc-like at the apex of such fused plates, which make the distal portion of the fused styles broadly winged. Capsule 7–8 mm. long, black, firm, laterally furrowed on septum (as in *Sophronanthe*), distally attenuate, loculicidal and secondarily somewhat septicidal. Seeds 0.4 mm. long, cylindric, brown, rugose-reticulate.

[6]As suggested by the broken base of No. 7816. If so, this forms a strong contrast with *Adenosma coeruleum* and *A. papuanum*.

[7]Upper lip drawn as with entire apex on Banks and Solander's plate, and so described in the accompanying text of *Adenosma coeruleum*.

Type, savannas, Lake Daviumbu, Middle Fly River, Papua, collected in flower and fruit in September, 1936, by *L. J. Brass,* no. 7816, and deposited in Herb. Academy of Natural Sciences of Philadelphia. The plant was reported as "abundant on ground grazed short and trampled by wallaby". More leafy specimens, not yet in blossom, were found occurring as common weeds in old deserted gardens at Mabaduan, Western Division, Papua, where gathered in April, 1936, by *Brass,* no. 6574.

3. **Torenia** Linnaeus

1. **T. polygonoides** (Benth.) Benth., Scroph. Ind. 39. 1835.

Lake Daviumbu, Middle Fly River, on leafy ground near edge of swamp in rain-forest, *Brass* 7551; flowers pink. A wide-spread Indo- and Austro-Malayan species.

*3a. **Artanema** D. Don

The large growth, with accompanying large purple flowers and elongated leaves, distinguishes this genus at once from other Oriental and Australian Gratioleae. The enlarged knob-like outgrowths of the lower pair of filaments are also distinctive. As in *Lindernia,* these knobs are clearly caused by a folding of the filaments, the conducting tissue passing through them as a loop on its way to the anthers.

*1. **A. longifolium** (L.) Vatke, Linnaea **43**: 307. 1882.

East bank of lower Fly River, opposite Sturt Island, collected in flower October, 1936, by *L. J. Brass,* no. 8143. A wide-spread Indo-Malayan, and evidently also Austro-Malayan, species.

In the collection at hand the leaves reach at least 15 cm. long and 2 cm. wide, while the lower ones were perhaps still larger. The blades are remotely serrate with low teeth, so that both in form and margin they contrast with the plant shown as this species on Tab. 8687 of Botanical Magazine in 1916. However, both Bentham's and Hooker's accounts of it speak of the leaves as varying from entire to serrate, while Linnaeus' description of *Columnea longifolia*[8] gave the leaves as very long and subserrate, a characterization perfectly fitting our specimen.

The species has had a checkered nomenclatural history. It was first considered generically distinct by Vahl, who in 1791[9] constituted it his

[8]Mant. Pl. 90. 1767.

[9]Symb. Bot. **2**: 71. 1791.

genus *Achimenes*, calling this species *A. sesamoides*, but including *Columnea longifolia* in synonymy. Because antedated by *Achimenes* P. Browne of the Gesneriaceae, this genus lapsed. In 1835 David Don based his genus *Artanema* on the Australian *Torenia fimbriata* Hook., and in 1835 Bentham added to it the present species as *A. sesamoides* (Vahl), still including *Columnea longifolia* in synonymy. Although not recorded by the "Index Kewensis," the combination *Artanema longifolium* was actually proposed by Vatke in 1880-82,[10] as indicated by S. A. Skan in 1916,[11] although it has been credited usually either to Wettstein in 1891,[12] or to Merrill in 1923.[13]

Since the leaf-blades of *Artanema longifolium* appear to be so variable in width and degree of cutting, it is likely that A. *angustifolium* Benth.[14] from Singapore will prove to be merely a narrow-leaved extreme. In such forms, as in the present collection from Papua, the basal narrowing of the leaf-blade fails to become petiolar.

4. **Lindernia** Allioni

The second Archbold series includes 5 species of this genus, in which, as previously explained, *Ilysanthes* is also included. One species is proposed as new to science, and for another Dr. Merrill has called attention to a specific name older than that which Dr. Schlechter and I employed.

1. **L. crustacea** (L.) F. V. Muell. Census 97. 1882.

Collections of this wide-spread weed were made at Palmer River (*Brass* 7086) and Lake Daviumbu, Middle Fly River (*Brass* 7537).

*1a. **L. crenata** Pennell, sp. nov.

Herba annua, 2–3 dm. alta, laxe ramosa; caulis et rami ad nodos pilosi; folia ovata, obtusa, basi cuneata, crenata, utrinque pilosa, petiolata, laminis 2–2.5 cm. longis, 0.8–1.2 cm. latis, petiolis hirsutis, 3–5 (infimis 8) mm. longis; pedicelli 15–20 mm. longi, divaricati; bracteolae nullae; sepala 5, lanceolata, attenuata, hirsuta, 7 mm. longa; corolla 7–8 mm. longa, violacea, extus glabra, labio supero concavo lobis rotundatis fere integro, labio infero explanato, trilobato, lobis rotundatis vel retusis; stamina 4, glabra, inclusa, antheris inferis

[10]Linnaea **43**: 307. 1882.
[11]Bot. Mag. **142**: t. 8687. 1916.
[12]Nat. Pflanzenfam. iv. **3b**: 79. 1891 as "A. longiflorum (L.) Wettst."
[13]Enum. Philip. Flow. Pl. **3**: 436. 1923.
[14]DC. Prodr. **10**: 408. 1846.

minoribus rudimentis; capsula 4 mm. longa, brunnea, in calyce inclusa, septicida, septo persistente; semina 0.3 mm. longa, turgida, alveolato-reticulata.

Stems 2–3 dm. tall, ascending or erect, laxly branched, pilose near the nodes, the internodes longer than the leaves. Leaves opposite: blades ovate, 2–2.5 cm. long, 8–12 mm. wide, obtuse, crenate, slightly paler beneath, somewhat pilose on both surfaces, especially on the main veins, the blades abruptly cuneately narrowed to the short hirsute petioles, 3–5, or the lowermost 8 mm. long. Bracts leaf-like, but acute to acuminate and reduced, 1.3–1.7 cm. long. Pedicels 15–20 mm. long, divaricately spreading. Bractlets none. Sepals five, lanceolate, attenuate, hirsute, the upper three slightly longer, 7 mm. long, all more or less united proximally but eventually becoming distinct, or the two lower tending to cohere permanently. Corolla 7–8 mm. long, violet;[15] upper lip broadly arched, with rounded lobes that unite nearly to apex; lower lip slightly spreading, its free lobes shortly rounded or retuse, proximally the base of the lower lip and the throat anteriorly with two slightly puberulent ridges, the corolla elsewhere glabrous. Free postero-lateral filaments incurved, short, arising distad to the middle of the corolla, the proximal portion being so completely fused with the corolla-tube as not to be evident above its surface; their anthers approximate (with cells contiguous in form of St. Andrews' Cross), the connective loosely dilated and extending much below the lower anther-cell.[16] Antero-lateral filaments fused with and partially forming the antero-lateral ridges of the corolla, each distally forming a pyriform-cylindric knob from the base of which arises a short free filament which bears a rudimentary 2-celled anther. Stigmas distinct, lamellate, within the upper lip. Capsule 4 mm. long, ellipsoid, brown, enclosed within calyx, dehiscing septicidally, with the septum persisting as a thin plate. Seeds turgid, irregularly globose, 0.3 mm. long, yellow, with shallowly alveolate reticulations.

Type, common on wet grass plains, Lake Daviumbu, Middle Fly River, Papua, collected in flower and fruit September, 1936 by *L. J. Brass,* no. 7824; in Herb. Academy of Natural Sciences of Philadelphia. Only collection seen.

Probably the kinship of this species is in the Section *Torenioides,* as indicated by the shape and surface-markings of the seeds, the lack of

[15]Recorded as "purple," but the corolla-lobes still show violet, and this or blue-violet is the prevalent color in *Lindernia.* Within the throat anteriorly and proximally yellow coloration is still apparent, and I do not doubt that this species really shows the elaborate color-pattern usual in the genus.

[16]Placed parallel to it, not transversely as in *Gratiola.*

apiculation on the capsule, and the somewhat united sepals. From other members of the group it differs in erect habit and especially in reduction of the anthers of the anterior stamens. In fact, the state of the latter forms an excellent gradation between the old concepts of *Lindernia,* with all the four stamens perfect, and *Ilysanthes,* with the anterior pair of filaments lacking anthers.

2. **L. pusilla** (Thunb.) Merr. Philipp. Jour. Sci. Bot. **11**: 312. 1916.

Lake Daviumbu, Middle Fly River, carpeting small grassless patches on wet savannahs, *Brass* 7882; flowers cream-colored.

5. **L. antipoda** (L.) Alston, Fl. Ceylon **6**: 214. 1931.

Gaima, east bank of Lower Fly River, massed in semi-shade on tidal fore-shores, fresh-water, *Brass* 8318; flowers lavender-colored.

Dr. Merrill has called my attention to the fact that *Gratiola veronicaefolia* Retz. (1810) is a synonym of *Ruellia antipoda* L. (1753), as has been explained by him in his "Interpretation of Rumphius' Herbarium Amboinense" of 1917, where he made the combination *Ilysanthes antipoda* (L.) Merr. (p. 467). Transferred to *Lindernia,* this becomes *L. antipoda* (L.) Alston, Fl. Ceylon **6**: 214. 1931, a name that should replace *L. veronicaefolia* (Retz.) F. V. Muell. in my paper of 1936.

On consulting Alston's volume, I was interested to see that, although without discussion, he had there united under *Lindernia* the different genera which I subsequently brought together in 1935. This course is so logical, that I am not surprised that we have both adopted it independently.

7. **L. ruellioides** (Koenig) Pennell, Brittonia **2**: 182. 1936.

Palmer River, two miles below junction of Black River, sunny positions on rocks swept by river flood-waters, alt. 100 m., *Brass* 7085; flowers lavender-colored.

7. **Centranthera** R. Brown[17]

1. **C. cochinchinensis** (Lour.) Merr. Trans. Amer. Philos. Soc. II. **24**: 353. 1935.

[17]Dr. Merrill accepted *Razumovia* Sprengel (1807) in place of *Centranthera* R. Brown (1810), as the oldest valid generic name for this group, following Britten and Alston; see Bull. Torr. Bot. Club **64**: 589-598. 1937. He now calls my attention to the fact that Sprengel actually published *Razumovia* for an entirely different group of the Compositae in 1805, not in 1826 as listed in current literature. *Razumovia* Spreng. Allgem. Lit.-Zeit. Intelligenzbl. 136. 1805 is a synonym of *Humea* Smith (1804), but this publication invalidates the use of the same generic name for the very different *Razumovia* Spreng. 1807 = *Centranthera* R. Brown. He has reconsidered the case, abandoning *Razumovia* Spreng. and reinstating *Centranthera* R. Br. for the scrophulariaceous genus.

As explained by Dr. Merrill,[18] *Digitalis cochinchinensis* of Loureiro's "Flora Cochinchinensis" (p. 353) of 1790 antedates *Centranthera hispida* R. Br. of 1810, the name which Schlechter and I have used for the species.

In addition to the two stations cited in 1936 are the following records from the Fly River: Lake Daviumbu, Middle Fly River, common on savannahs, *Brass* 7815; and Gaima, Lower Fly River, in open savannah-forests, common and conspicuous, *Brass* 8270. Both note "flowers yellow."

8. **Buchnera** Linnaeus

*2. **B. urticifolia** R. Br. Prodr. **1**: 437. 1810.

The following collections seem to pertain to this Australasian and East Indo-Malayan species. After citing eight specimens from northeastern and one from southwestern New Guinea and also one from the Bismarck Archipelago, Schlechter states that what he has seen differs from *B. urticifolia* in the usual very thick hairy indumentum of the inflorescence-rhachis and the larger flowers. But our plants from southeastern New Guinea have only moderate or short hairs on the rhachis or are essentially glabrous through the inflorescence, while the flowers are small (8–11 mm. long). Moreover, the corollas are uniformly glabrous externally, and not variable in hairiness as stated by Schlechter. Clearly, there are two species in New Guinea, of which ours accords closely with *B. urticifolia,* the common plant of northern Queensland in northeastern Australia.

Whether our specimens all pertain to the very same species is doubtful. All are recorded as bearing pink flowers. The five collections seen differ as follows, the distinctions being possibly mere local variations or perhaps denoting specific or subspecific trends:

A. Inflorescence throughout finely pubescent.

B. Plant 10–15 dm. tall, the middle cauline leaves ample, 5–7 cm. long, 1–2 cm. wide, the upper abruptly linear-lanceolate. — Lake Daviumbu, Middle Fly River, common on savannahs, *Brass* 7813, in flower Sept., 1936; Gaima, Lower Fly River (east bank), open savannah-forest, occasional in thick grass cover, *Brass* 8253, in flower and fruit Nov. 1936.

BB. Plant 3–4 dm. tall, the middle cauline leaves narrower (largest lost from specimen), the upper rather abruptly smaller. — Urunu, 1500 m. alt.,[19] old artificial grass slope, *Brass* 4821, in flower and fruit Aug., 1933.

[18] Trans. Amer. Philos. Soc. II. **24**: 353. 1935.

[19] Original altitude-record of 2840 m. corrected in Brittonia **3**: 95. 1938.

AA. Inflorescence glabrous, except for minute ciliation of bracts, bractlets and calyx-lobes; plant 5–6 dm. tall, the middle cauline leaves small, narrow, 2–3 cm. long, 0.3 cm. wide, leaves gradually passing from the short wide lower to the subulate upper ones. — Tarara, Wassi Kussa River, Western Division, *Brass* 8571 and 8597, in flower Dec., 1936.

9. **Striga** Loureiro

Apparently the species of this genus show striking contrasts in color, although this is a matter not considered in the old descriptions. Thus, Schlechter's account terms the flowers of *S. lutea* cinnabar-red, of *S. Wallichii* snow-white or very pale yellowish, and of *S. multiflora* brilliant orange-yellow, the last on drying becoming dark bluish gray. L. J. Brass gives the color of the present two species as white and as purple, by the latter of which I suspect violet is really intended. There is urgent need to discover the colors pertaining to the species first described from northeastern Australia, so as to make more use of color-distinctions in this critical group. The following species collected by Brass are closely akin to *S. multiflora* Benth., also originally from northeastern Australia.

Corolla white, 12–15 mm. long, externally pubescent, the throat distinctly wider than the tubes; leaves 2–4 cm. long, the middle ones longer and somewhat spreading. 1a. *S. curviflora*

Corolla violet ("purple"), 7–8 mm. long, externally puberulent, the throat ill-defined though slightly wider than the tube; leaves 1.5–2.5 cm. long, all ascending or the middle ones hardly spreading. 1b. *S. parviflora*

*1a. **S. curviflora** (R. Brown) Bentham, Compan. Bot. Mag. **1**: 362. 1835.

Buchnera curviflora R. Br., Prodr. **1**: 438. 1810.

Gaima, east bank of lower Fly River, open savannah-forest, common in thick grass cover, *Brass* 8256; flower white.

As originally described by Robert Brown this was distinguished from the following by its more elongate and spreading leaves, the retuse upper lip of the corolla, and the upper being only 1/3 the length of the lower corolla-lip. To this Bentham added that the corolla is pubescent. With this characterization our plant agrees except that the upper is about ½ - ⅔ as long as the lower corolla-lip.

In his paper of 1835 Bentham added a related species, *S. multiflora* (p. 313), differing especially in its corolla being glabrous, the upper only little shorter than the lower lip, and in its "long almost decumbent habit." Later, in his Flora Australiensis (**4**: 516. 1869), the two were contrasted wholly as to the corolla-size and -proportions, the corolla of

S. multiflora being "glabrous glandular or pubescent." By this new classification our plant would be *S. multiflora*, but I suspect that actually the pubescence of the corolla externally will prove of sufficient significance to break such an alignment.[20] Accordingly, I am holding our specimen, remarkable for its hairy corolla, as more probably a form of *S. curviflora*.

*1b. **S. parviflora** (R. Brown) Bentham, Compan. Bot. Mag. **1**: 362. 1835.

Buchnera parviflora R. Br., Prodr. **1**: 438. 1810.

Port Moresby, Central Division, open savannah-forest, common on stony hillsides, alt. 200 m., *Brass* 8780; flowers purple.

As originally described by Robert Brown this was distinguished from the foregoing by its strict leaves, the entire upper lip of the corolla, and the upper being ½ the length of the lower lip or slightly more. To this Bentham added that the corolla is pubescent. With this characterization and his subsequent statement of corolla-size,[21] our plant agrees exactly.

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[20]Probably the plant of Northeastern New Guinea, identified by Schlechter as *Striga multiflora* Benth. but said to have bright orange-yellow flowers, will prove to be some other species, as yet undescribed.

[21]Fl. Austral. **4**: 516. 1869.

NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE COLLECTIONS OF THE ARNOLD ARBORETUM

ALFRED REHDER

Abies Ernesti, nom. nov.

Abies firma Masters in Jour. Linn. Soc. Bot. **37**: 422 (1906), non Sieb. & Zucc.

Abies Beissneriana Rehder & Wilson in Sargent, Pl. Wilson. **2**: 46 (1914). — Chun, Chin. Econ. Trees, 30 (1922). — Dallimore & Jackson, Handb. Conif. 87 (1923); ed. 2, 87 (1931). — Rehder in Bailey, Cult. Evergr. 254 (1923); Man. Cult. Trees Shrubs, 32 (1927). — Fitzpatrick in Sci. Proc. Roy. Dublin Soc. **19**: 207 (1929). — Viguié & Gaussen in Bull. Soc. Hist. Nat. Toulouse, **58**: 272 (Rev. Gen. Abies 94) (1929). — Fitschen in Beissner, Nadelholzk. ed. 3, 133 (1930). — Bailey, Cult. Conif. 85 (1933). — Li, For. Bot. China, 30 (1935). — Non Mottet (1902).

Since the name *Abies Beissneriana* Rehd. & Wils. is a later homonym of × *A. Beissneriana* Mottet in Rev. Hort. **1902**: 163, a hybrid of *A. Nordmanniana* and Pinsapo,[1] and therefore not valid, this species may bear the name of its discoverer, Ernest H. Wilson, who introduced it into cultivation in 1904 and again in 1908, but at present it is rare and only a few trees are known to exist in England (cf. Rep. Conif. Confer. Roy. Hort. Soc. pp. 225, 353. 1931), and in France probably raised from seed from "Tnong-Kong," sent in 1924 by the French consul at Chengu-tu (cf. Viguié & Gaussen, l.c.).

Picea notha (*P. Glehnii* [Fr. Schmidt] Mast. ♀ × *jezoensis* var. *hondoensis* [Mayr] Rehd.), hybr. nov.

Arbor habitu *Piceae Glehnii;* ramuli brunnei sparse pilosi, sterigmatibus angulo recto divergentibus 0.75 mm. longis basi tumidis: gemmae conico-ovoideae obtusiusculae, fusco-brunneae, valde resinosae, squamis paucis acuminatis dimidiam gemmam non excedentes, folia ramulorum robustiorum circiter 1.5 cm. longis et circiter 1.25 mm. latis, ramulorum tenuiorum minora, apice abrupte in mucronem obtusiusculum contracta, falcata, ramum supra dense et subadpresse tegentia, subtus fere pectinatim patentia, ventre carinata fasciebus duobus albis e seriebus stomatum 5–7 compositis, dorso lucida laete viridia, leviter obtuseque carinata utrinsecus stomatum seriebus 1–2, rarius 3, partim incompletis notata. Strobili cylindrico-oblongi, 4.5–5.5 cm. longi, im-

[1] = *Abies insignis* Carr. var. *Beissneriana* (Mottet) Rehder in Jour. Arnold Arb. **1**: 54 (1919).

maturi virides, squamis laxe adpressis flexibilibus rhombico-ovatis 1 cm. longis et 7–8 mm. latis leviter striatis et undulatis, apice rotundatis vel supra medium angustatis et truncatis eroso-denticulatis, bracteis triangulari-ovatis circiter 3 mm. longis; semina ala inclusa quam squama triente breviora. Proxima *Piceae jezoensi* var. ***hondoensi,*** quae facile distinguitur ramulis ochraceis glabris, gemmis bracteis subulatis carentibus, foliis non falcatis, dorso stomatibus destitutis atroviridibus, ventre fasciebus stomatum latioribus magis candidis, strobili squamis angustioribus magis undulatis et erosis apice saepius emarginatis. *Picea Glehnii,* parens feminea, differt ramulis densius pilosis, gemmis basi squamis subulatis gemmae subaequilongis, sterigmatibus brevioribus non tumidis, foliis minoribus 6–12 mm. longis leviter compressis, fasciebus stomatiferis ventre e seriebus stomatum 4–5, dorso 1–3 compositis, strobilis squamis firmis rotundatis, 1–1.4 mm. latis nitidulis margine integro vel vix denticulatis.

Cult. Arnold Arboretum under no. 13406, raised from seed received in 1894 from the Government Forestry School, Tokyo. Specimens in herb.: Coll. *A. Rehder,* April 5, 1917 (sterile); coll. *A. Rehder & E. J. Palmer,* Sept. 28, 1936 (fruiting; type).

From the seed received in 1894 as *Picea Glehnii* about 15 plants were planted, one of which turned out to be the hybrid described above, all the others were true *P. Glehnii.* The seeds must have been collected from a tree or trees growing in the vicinity of trees of *P. jezoenis* var. *hondoensis,* and the flowers partly pollinated by the latter. The tree growing here is about 8 m. tall and is clearly intermediate between *P. Glehnii* and *P. jezoensis* var. *hondoensis,* though in general appearance resembling the latter; from *P. Glehnii* it is easily distinguished by the less pilose branchlets, by the longer sterigmata much thickened at base, the larger compressed leaves with fewer stomatic lines on the dorsal and more numerous lines on the ventral side, and by the cones with flexible, narrower and distinctly erose-denticulate scales; from the latter it differs in the pilose brown branchlets, in the presence of a few stomatic lines on the dorsal side of the leaves and in the broader less undulate cone-scales.

Taxodium distichum (L.) Rich. f. **pendens,** nom. nov.

Taxodium distichum nutans Carrière, Traité Conif. ed. 2, 183 (1867). — Beissner, Handb. Nadelholzk. 152 (1891). — Non *T. d.* var. *nutans* (Ait.) Sweet.

Taxodium distichum pendulum Horsey in Horticulture, Boston, ser. 2, 3: 446, fig. (1925). — Slavin ex Bailey, Cult. Conif. 138 (1933), pro var. — Non *T. d. pendulum* (Endl.) Carr.

A form of typical *T. distichum* with slender pendulous branchlets with the leaves usually somewhat more distant than in the type. This is the form referred to in the remarks under *T. ascendens* f. *nutans* in Jour. Arnold Arb. **7**: 22 (1926), where in the citations of synonyms under *T. distichum pendulum*, the reference to Horsey should be eliminated.

Thuja occidentalis f. **Mastersii**, nom. nov.

Thuia plicata Endlicher, Syn. Conif. 51 (1847), pro parte. — Carrière, Traité Conif. 102 (1855), pro parte. — Gordon, Pinet. 325 (1858) *"Thuja,"* ex parte. — Henkel & Hochstetter, Syn. Nadelhölz. 277 (1865), pro parte. — Parlatore in D.C., Prodr. 457 (1868), *"Thuja."*— Beissner, Handb. Nadelholzk. 44 (1891). — Non Lambert (1824).

Thuja occidentalis plicata Wells in Proc. Roy. Hort. Soc. 3: 303 (1863), nom. nud.

Thuya occidentalis var. *plicata* Masters in Gard. Chron. ser. 3, **21**: 258 fig. 86 (1897). — Kent in Veitch, Man. Conif. ed. 2, 247 (1900). — Beissner, Handb. Nadelholzk. ed. 2, 504 (1909). — Rehder in Bailey, Cult. Evergr. 223 (1923) *"Thuja"*; Man. Cult. Trees Shrubs (1927). — Dallimore & Jackson, Handb. Conif. 511 (1923) *"Thuja."* — Non Hoopes (1868).

Since *Thuja occidentalis* var. *plicata* Mast. is a later homonym of *Th. occidentalis* var. *plicata* Hoopes, Book Evergr. 321 (1868) a new name is needed for this garden form and it may well bear the name of Masters who first cleared up the existing confusion between this form and the western species. Hoopes' name is based, at least as to the name bringing synonym and the habitat, on *Th. plicata* Lamb., and must stand as the correct name for this tree, if transferred to *Th. occidentalis* as a variety.

Ulmus procera f. **myrtifolia**, f. nov.

Ulmus campestris var. *myrtifolia* Hort. ex Nicholson in Kew Hand-list Trees Shrubs, **2**: 135 (1896), nom. nud.; op. cit. ed. 2, 615 (1902); op. cit. ed. 3, 271 (1925), nom. nud.

Ulmus buxifolia Hort. ex Nicholson, l. c., pro synon. praeced.

Ulmus procera var. *myrtifolia* Bean in Kew Hand-list Trees Shrubs, ed. 4, 341 (1934), nom. nud.

Arbor ramis gracilibus. Folia ovata vel rhombico-ovata rarius oblongo-ovata, 2–5 cm. longa, basi obliqua, serrata dentibus simplicibus vel infra denticulo parvo instructa, utrinque laxe pilosis, subtus praecipue ad venas; petiolus 2–4 mm. longus. Fructus obovatus, 12–15 mm. longus; semen apicem clausum attingens.

Kew Arboretum, *Geo. Nicholson*, July 22, 1880 (as *U. myrtifolia* Volxem), type. Hort. Mrs. R. H. Bole, Cleveland, Ohio, June 15, 1927.

This form of *U. porcera* differs chiefly in its small leaves from typical *U. procera,* and in this respect is similar to *U. procera* var. *viminalis* (Loud.) Rehd., but this has longer and narrower, incisely serrate leaves. The second specimen agrees well with the first, but on the more vigorous shoots, the leaves are narrower and longer, up to 5 cm. long, resembling somewhat those of var. *viminalis,* while in the type specimen they are only 2–3 cm. long and always rhombic or rhombic-ovate; the description of the fruit is based on this specimen, the type specimen being sterile. Plants from the tree in Cleveland are growing in this Arboretum.

The plant known as *U. campestris myrtifolia purpurea* DeSmet = *U. procera* f. *purpurascens* (Schneid.) Rehd. has generally larger leaves and is not a purple-leaved variation of the form described above.

Ulmus pumila L. f. **Androssowi** (Litvin.), comb. nov.

Ulmus Androssowi Litvinov in Sched. Herb. Fl. Ross. **8**: 23, 202, t. 2 (1922).

TURKESTAN: city of Samarkand, cult., *Bubyr & Androssov,* March 5, April 18 and July 29, 1913 (Herb. Fl. Ross. no. 2445, isotype, 3 sheets; 3 photos. of type). Taschkent, cult., *Bubyr & Androssov* Feb. 14, March 29, Sept. 11, 1914 (Herb. Fl. Ross. no. 2788).

This form differs from typical *U. pumila* in its very dense spherical crown and also in the pubescent leaves which are usually glabrous in *U. pumila.* It is known only as a cultivated tree and has been much confused with *U. carpinifolia* Gled. var. *umbraculifera* (Trautv.) Rehd. (*U. campestris* var. *umbraculifera* Trautv., *U. turkestanica* Reg., p. p.) which Litvinov cites as pro parte synonyms of his *U. Androssowi.* Both are planted in Turkestan as street trees, sometimes together on the same street, as shown by a photograph taken by Androssov in Samarkand (in Sched. Herb. Fl. Ross. **8**: t.2). Though similar in habit, *U. pumila* f. *Androssowi* may be easily distinguished from *U. carpinifolia* var. *umbraculifera* by the grayish or grayish brown bark of the branchlets with conspicuous corky wings on older branches, by the pubescent winter-buds, by the leaves being shallowly and mostly simply serrate, loosely villous beneath and by the suborbicular fruit 10–13 mm. in diam., with the seed slightly above the middle; in *U. carpinifolia* var. *umbraculifera* the branchlets are conspicuously red-brown and do not become corky, the leaves are more sharply and more distinctly doubly serrate, only slightly puberulous beneath when young, soon glabrous, and the obovate fruit is cuneate at base and about 1.5 cm. long, with the seed close to the notch and well above the middle. Sterile specimens of the two elms may not

always be easy to distinguish, but the characters of the fruit are constant and reliable.

Ulmus pumila is very variable in habit and leaf characters. It was originally based by Linnaeus (Sp. Pl. 226) on the shrubby form from Siberia, but Pallas (Fl. Ross. **1:** 76, t.48. 1788) included an arboreous form (fig. D) from southern Russia with it. This plant, however, does not belong to *U. pumila,* but represents *U. carpinifolia* whose range extends from Europe to Transcaucasia and reaches its eastern limit in Turkestan, where *U. pumila* reaches its furthest western extension. One of the first authors to include in *U. pumila* the tree form from N. China was Planchon (in D.C., Prodr. **17:** 159. 1873) and all later authors followed him until Nakai in 1932 (Fl. Sylv. Kor. **19:** 22) separated the tree of Korea, Manchuria and northern China as *U. manshurica;* he also considers the arboreous form of Turkestan, *U. pumila* var. *arborea* Litv., a distinct species for which he adopted the name *U. pinnato-ramosa* Dieck. I cannot see any specific difference between the tree-like and shrubby form; both forms occur in Manchuria and northern China and are probably only ecological variations caused by soil and climatic conditions. Skvortzov in Lingnan Sci. Jour. **6:** 208 (1928) describes a var. *genuina* as a round-topped tree with erect branches and distinguishes three forms based on size and shape of the fruit; in Bull. Jard. Bot. U.R.S.S. **28:** 544 a year later, he describes two more varieties, but rather briefly and as in the preceding publication, without citation of locality or specimens; he does not mention a shrubby form. The form in general cultivation is the tree-like form.

Clematis Armandi Franchet in Nouv. Arch. Mus. Paris, ser. 2, **8:** 184, t.2 (Pl. David. **2:** 2, t.2) (1885). — Finet & Gagnepain in Bull. Soc. Bot. France, **50:** 526 (1903); Contrib. Fl. As. Or. **1:** 11 (1905); in Lecomte, Fl. Gén. Indochine, **1:** 3 (1907). — Rehder & Wilson in Sargent, Pl. Wilson. **1:** 326 (1913), pro parte. — P'ei in Sinensia, **6:** 388 (1935).

Clematis hedysarifolia γ *Armandi* Franch. pr. sp. in msc. ex Kuntze in Verh. Bot. Ver. Brandenb. **26:** 152 (1885, May 28).

Clematis ornithopus Ulbrich in Rep. Spec. Nov. Beih. **12:** 375 (1922).

The type of *C. Armandi* is characterized by a solitary peduncled and leafy inflorescence, and by rather small flowers 2.5–3.5 cm., across with 4 or 5 petals. This form is rather rare and represented in this herbarium by only six specimens from Hupeh, Szechuan, Hunan and Yunnan; also *C. ornithopus* Ulbrich belongs here. Much more com-

mon are the forms with 4 or 5 sepals and leafless panicles. Of this, two forms may be distinguished: one with a solitary peduncled inflorescence represented in this herbarium by three specimens from Szechuan, three from Yunnan, two from Hunan and one from Annam; and one with mostly sessile or subsessile inflorescences represented by three specimens from Hupeh, two specimens from Szechuan and three from Yunnan. The last named form represents a transition to the following variety which has the inflorescence also branching from the base, but has larger flowers about 4–6 cm. across with 5–7, usually 6, broader petals.

Clematis Armandi var. **Biondiana** (Pavol.), comb. nov.

Clematis Armandi Finet & Gagnepain in Bull. Soc. Bot. France, **50**: 526 (1903); Contrib. Fl. As. Or. **1**: 11 (1905), pro parte. — Pampanini in Nuov. Giorn. Bot. Ital. n. ser. **17**, **2**: 269 (1910). — Rehder & Wilson in Sargent, Pl. Wilson. **1**: 326 (1913), pro parte. — Sprague in Bot. Mag. **140**: t. 8587 (1914).

Clematis Biondiana Pavolini in Bull. Soc. Tosc. Ort. **32**: 285 (1907); in Nuov. Giorn. Bot. Ital. n. ser. **15**: 401 (1908). — P'ei in Sinensia, **6**: 389 (1935).

This variety differs chiefly in its larger flowers 3.5–6.5 cm. across with 5–6, sometimes 7 sepals; its inflorescence is leafless and sessile, branching from the very base which gives the inflorescence the appearance of several axillary panicles. It is represented in this herbarium by a photograph of the syntype from Sian Men K'vn (Silvestri no. 627), by Silvestri no. 629 and five other specimens from Hupeh; of these Wilson's specimen no. 95 from Chanyang Hsien and an unnumbered Henry specimen differ in the panicles being partly leafy and leafless on the same specimen. This variety is the commonly cultivated form; among the illustrations in horticultural publications which I compared, I found 15 illustrations representing var. *Biondiana* and only two, one by Mottet in Rev. Hort. n. ser. **13**: 65, fig. 18 (1913), and one by Lemperg in Gartenschönh. **9**: 284, fig. (1928) which clearly represent the typical form of *C. Armandi*.

Clematis Armandi f. **Farquhariana** Rehder & Wilson in Sargent, Pl. Wilson. **1**: 327 (1913).

Clematis Armandi var. *Farquhariana* Rehder, Man. Cult. Trees Shrubs, 225 (1927) pro parte, excl. syn. & fig. cit.

This form differs from the preceding variety only in the pale pink color of its flowers. It is represented in this herbarium only by the type specimen and is apparently not in cultivation.

Clematis Armandi grandiflora Mottet in Rev. Hort. n. ser. **17**: 276,

fig. 68 (1921); Arb. Arbust. Orn. 20, fig. 3 (1925), pro var., is probably a hybrid according to Mottet; it has sometimes 5 or 7 leaflets, more coriaceous than in *C. Armandi* and purple when unfolding, while *C. Armandi* has constantly 3-foliolate leaves. Mottet states that the plant was received from La Mortola. There is a specimen under this name received from Hort. Vilmorin in this herbarium with 3-foliolate leaves differing from *C. Armandi* only in the narrowly elliptic sepals overlapping at the base and only 18 mm. long.

Clematis koreana Komar. f. **lutea**, f. nov.

Clematis koreana var. *lutea* [Bean in] Kew Hand-list Trees Shrubs, 68 (1934), nom. nud.

Forma floribus luteis.

Clematis koreana was originally described by Komarov (in Act. Hort. Petrop. **18**: 438. 1904) as varying with yellow flowers in open situations, or with violet flowers in moist and shady situations. There is no indication which he considers typical. In a flowering specimen from Korea (Wilson 8616) the flowers are described as reddish, while in a specimen from Manchuria (Komarov 703) the flowers seems to be yellow. A variety described and figured by Nakai as *C. koreana* var. *umbrosa* (in Matsamura, Icon. Pl. Koishik. **4**: 107, t.266. 1921) is stated to have purple-red flowers. In a cultivated specimen from the Dendrological Garden at Pruhonice, Czechoslovakia, collected 1923, the flower is unmistakably violet, while a cultivated plant figured by F. Lemperg (in Gartenschönh. **9**: 286) is stated to have yellow flowers. Since the yellow-flowered has been separated, at least in gardens, as a distinct form, it seems best to consider the plant with violet or reddish flowers as typical.

Magnolia Wilsonii (Fin. & Gagnep.) Rehd. f. **Nicholsoniana** (Rehd. & Wils.), comb. nov.

Magnolia Nicholsoniana Rehder & Wilson in Sargent, Pl. Wilson. **1**: 394 (1913). — Wilson in Jour. Arnold Arb. **7**: 235 (1926). — Millais, Magnolias, 178 (1927). — Rehder, Man. Cult. Trees Shrubs, 255 (1927).

Magnolia taliensis W. W. Smith in Notes Bot. Gard. Edinb. **8**: 341 (1915).

Magnolia liliifera var. *taliensis* Pampanini in Bull. Soc. Tosc. Ort. ser. 4, **1**: 137 (1916).

Magnolia Wilsonii (Fin. & Gagnep.) Dandy in Notes Bot. Gard. Edinb. **16**: 126 (1928), pro parte, quoad synon. *M. Nicholsoniana* et *M. taliensis*.

Specimens examined: S z e c h u a n, *E. H. Wilson* 838 (type of

M. Nicholsoniana); Yunnan, *G. Forrest* 15476, *J. F. Rock* 8620, 8639, *S. Ten* 302, 564.

This form differs from *M. Wilsonii* in its leaves being glaucescent and glabrescent beneath except the rufous-pilose midrib, while *M. Wilsonii* has the underside of the leaves densely covered with long subappressed white silky hairs. The latter is represented in this herbarium by the following specimens: Szechuan: *Wilson* 1374 and Veitch Exp. 3137, *Harry Smith* 1953; Yunnan: *S. Ten* 500, 593; also by several cultivated specimens. According to Dandy the material from Yunnan displays all intermediate degrees of hairiness; one of these intermediate forms is represented by Ten 593 which has the mature leaves only slightly and thinly pubescent. Intermediate forms, however, seem to be rare, and as the dense silky pubescence of the underside of the leaves gives the foliage quite a distinct aspect from that of the glabrescent form, it seems desirable, particularly from a horticultural point of view, to keep the glabrescent plant distinct, at least as a form.

Lindera aestivalis (L.) Bl. f. **xanthocarpa** (G. S. Torr.), comb. nov.

Benzoin aestivale f. *xanthocarpum* G. S. Torrey in Rhodora, **16**: 91 (1914).

Since the proposition to conserve *Lindera* Thunb. against *Benzoin* Fabric. had the majority of votes of the Special Nomenclature Committee for Phanerogamae and Pteridophyta appointed in 1935 by the International Botanical Congress, a new combination is necessary for the yellow-fruited form published under *Benzoin aestivale*.

Hydrangea serrata f. **prolifera** (Reg.), comb. nov.

Viburnum cuspidatum Thunberg, Fl. Jap. 125 (1785).

Hydrangea stellata Siebold & Zuccarini, Fl. Jap. **1**: 112, t. 59 (1840).

Hydrangea stellata β prolifera Regel in Gartenfl. **25**: 291, t. 521 (1866).

Hydrangea cuspidata Miquel in Ann. Mus. Bot. Lugd.-Bat. **3**: 98 (1867). — Koidzumi in Bot. Mag. Tokyo, **39**: 311 (1925).

Hydrangea opuloides var. *prolifera* Rehder in Bailey, Stand. Cycl. Hort. **3**: 1622 (1915).

Hydrangea serrata var. *stellata* Wilson in Jour. Arnold Arb. **4**: 245 (1923), which see for further citations of synonyms and literature.

Hydrangea cuspidata (Thbg.) Miq. var. *japonica* (Sieb.) Koidzumi in Bot. Mag. Tokyo, **39**: 311 (1925), pro parte.

Wilson when making the combination *H. serrata* var. *stellata* overlooked the fact that the oldest varietal epithet of this plan is "*prolifera*."

Viburnum cuspidatum Thunb. of which I examined the type and photographed it when in Uppsala in 1928, is referable to this form,

since it has all the flowers sterile, though the leaves are somewhat different being more sharply and closely serrate with a somewhat slenderer acumen than those of *Viburnum stellatum* α of Thunberg's herbarium which also represents this form and agrees more closely with the plant cultivated as typical "*stellata*" and with Regel's plate of *H. stellata* var. *prolifera*.

Koidzumi in 1912 (in Bot. Mag. Tokyo, **26:** 388) had identified *Hydrangea cuspidata* (Thunb.) Miq. with *H. involucrata* Sieb. and quoted the latter as a synonym of the former, but changed his opinion in 1925 after he had seen Thunberg's type; however, he did not pay any attention to the fact that *Viburnum serratum* and *V. cuspidatum* represent garden forms with all the flowers sterile.

Liquidambar Styraciflua L. f. **pendula,** f. nov.

A typo recedit ramis pendulis; arbor trunco excurrente ramis deflexis longis pendulis comam angustam formantibus.

This interesting new form was discovered near Hatton, Arkansas, about 1935 by Miss Sara W. Crawford. Only a single tree was found, of which Miss Crawford kindly sent us a leafy branch and photographs of the whole tree in summer and winter condition, (specimen coll. Sara W. Crawford, Oct. 9, 1938, and three photographs in herb. Arnold Arb.). We are also obliged to her for pieces of living root, from which we hope to propagate this tree. The tree observed is about 18 m. tall with a slender trunk about 23 cm. in diameter breast high; the straight upright trunk bends over at the top for about 3 m. and is clothed to the ground with deflexed pendulous branches of nearly equal length forming a slender narrow crown.

Of another interesting form of the sweet-gum, *L. Styraciflua* f. *rotundiloba Rehd.* (in Jour. Arnold Arb. **12:** 70, 1931) we have been promised a young plant by the discoverer Mr. R. E. Wicker of Pinehurst, N. C., so that we may hope to have both these interesting forms growing in this arboretum.

A third form described as *L. Styraciflua suberosa* Schwerin (in Mitt. Deutsch Dendr. Ges. **45:** 390, pl. 52. 1933) with all the branches strongly corky-winged is hardly worth distinguishing, since it represents the typical form of the tree, perhaps with the corky wings somewhat more strongly and plentifully developed than usual.

Spiraea virgata Franchet, Pl. Delavay. 199 (1890).

Spiraea myrtilloides Rehder in Sargent, Pl. Wilson. **1:** 440 (1913); Man. Cult. Trees Shrubs, 337 (1927). — **Synon. nov.**

When I had the opportunity to examine in the Paris herbarium the

types of Franchet's new species of *Spiraea*, I found that his *Spiraea virgata* agrees well with the species I had described in 1913 as *S. myrtilloides*. Additional material received later shows that the species is widely distributed in western Szechuan and in Yunnan and that it is very variable, particularly in its inflorescence which may be nearly sessile or borne on a very short lateral branchlet with few leaves at the base, or on an elongated leafy branchlet up to 4 cm. long; it may be glabrous or pubescent and may be a simple raceme with occasionally two flowers on one pedicel or the inflorescence may become corymbose with the lateral axes bearing 1–5 flowers. Such specimens approach *S. Schneideriana* Rehd. which is probably only an extreme variety of *S. virgata*, as I have already indicated under *S. Schneideriana* var. *amphidoxa* (op. cit. **1**: 450).

Cotoneaster microphylla Lindl. f. **melanotricha** (Franch.), comb. nov.

Cotoneaster buxifolia Wall. f. *melanotricha* Franchet, Pl. Delavay. 224 (1890).

YUNNAN: Hee-chan-men, *Delavay* 3742 (type; photo. and fragments in herb. Arnold Arb.); near Tali, alt. 3000 m., *C. Schneider* 2800, Oct. 16, 1914; eastern slopes of Likiang Snow Range, *J. F. Rock* 3460, May to Oct. 1922. Cult. Nursery Overrieden, Switzerland, June 1, 1938, raised from seed coll. by C. Schneider in 1914.

This variety was originally placed by Franchet under *C. buxifolia* Lindl., but differs in its glaucous papillose underside of the leaves furnished with scattered blackish hairs. It is perhaps only a form of *C. microphylla* var. *cochleata* (Franch.) Rehd. & Wils. from which it differs apparently only in its blackish hairs.

Sorbus hybrida L. var. **Meinichii** (Hartm.), comb. nov.

Sorbus Aucuparia Meinichii* Lindeb. mskr. ex Hartman, Handb. Skand. Fl. ed. 11, 271 (1879). — Hjelt in Act. Soc. Faun. Fl. Fenn. **41, 1**: 23 (Consp. Fl. Fenn.) (1919).

Sorbus Meinichii Hedlund in Svensk. Vetensk.-Akad. Handl. **35, 1**: 49, fig. 8 (Monog. Sorbus) (1901). — Schneider, Ill. Handb. Laubholzk. **1**: 675, fig. 370g (1906). — Blytt, Handb. Norges Fl. 420 (1906).

Pyrus aucuparia × (*aucuparia* × *intermedia*) Ascherson & Graebner, Syn. Mitteleur. Fl. **6, 2**: 105 (1906).

Sorbus aucuparia × *fennica* Lindman, Svensk Fanerogamfl. 305 (1918).

Since *Sorbus Meinichii* is generally considered as having originated as a cross between × *S. hybrida* with one of its parents, it must be classed as a variety of the binomial which stands for that group of hybrids; special binary names for different forms of the same parentage are not allowed under the International Rules.

Sorbus intermedia (Ehrh.) Pers. var. **arranensis** (Hedl.), var. nov.

Pyrus fennica Syme, Sowerby's Engl. Bot. ed. 3, 3: t. 485 (1864), non *P. fennica* (L.) Babington (1851).

Sorbus arranensis Hedlund in Svensk. Vetensk.-Akad. Handl. **35**, **1**: 60, fig. 12–14 (Monog. Sorb.) 1901. — Marshall in Jour. Bot. **54**: 10 (1916).

This variety is similar to *S. intermedia* var. *minima* (Ley) Bean, but the leaves are larger and more deeply divided, the lowest sinuses reaching more than halfway to the middle.

× **Sorbaronia Jackii** (*Aronia prunifolia* × *Sorbus americana*), hybr. nov.

Frutex, ramulis initio adpresse albo-villosis; folia infra pinnata pinnis 2–4 plerisque oblongis decurrentibus acutis vel acutiusculis serratis, superius lobata, apicem versus argute serrata, supra in costa sparse glandulosa, subtus villosa, glabrescentia, ea ramulorum florentium 3–7 cm. longa, apice acuta vel acutiuscula, interdum pauca simplicia vel tantum lobata, ea ramulorum sterilium ad 10 cm. longa et oblongo-lanceolata, manifeste acuminata; petioli 1–2 mm. longi, villosi. Inflorescentia satis densa, 3–4 cm. diam., laxe vel sparse villosa; calyx glaber vel fere glaber. Fructus ovoideus, circ. 8 mm. longus, atropurpureus.

Nova Scotia: Halifax, near entrance to Pt. Pleasant Park, *J. G. Jack* 677, June 16, 1918, no. 3242, June 21 and Sept. 30, 1924. Cult. in Arnold Arboretum under no. 18262 from plants introduced by J. G. Jack in 1924; specimens in herb. A.A.: Sept. 23, 1927, Sept. 25, 1929, May 16, 1930, May 22, 1933, May 11 and July 23, 1936.

This plant is apparently a hybrid between *Sorbus americana* Marsh. and *Aronia prunifolia* (Marsh.) Rehd. (*A. floribunda* Lindl., *A. atropurpurea* Britt.) which both grow on the island. Besides these species, *Aronia melanocarpa* (Willd.) Ell. and *Sorbus aucuparia* L. are found there, the latter naturalized. The villous pubescence of the underside of the leaves and of the inflorescence excludes the former and the acuminate leaves and the small inflorescence and small fruit the latter as possible parents of this hybrid.

Photinia villosa f. **Maximowicziana** (Lévl.), comb. nov.

Pirus sinensis Lindl. var. *Maximowicziana* Léveillé in Rep. Spec. Nov. **10**: 377 (1912).

Photinia villosa "(Thunb.) D. C." Rehder in Jour. Arnold Arb. **13**: 304 (1932) quoad synon. supra cit.

Korea: Quelpaert, in sylvis Haitchenam, *E. Taquet*, 2821, Aug. 1909 (holotype of *Pirus sinensis* var. *Maximowicziana*, photo. and iso-

type); in sepibus Spalkai [?], *E. Taquet* 1456, Oct. 30, 1908. Cult. Golden Gate Park, *E. Walther,* Sept. 10, 1928; Atlantic Nurseries, Berlin, Md., Nov. 3, 1937; Sunridge Nurseries, Greenwich, Conn., Oct. 13, 1938; Arnold Arboretum, no. 507 (plant received in 1879 from Parsons & Son who introduced it from Japan), June 11 & Oct. 1887, Oct. 20, 1890 and Oct. 13, 1892.

This form differs from type chiefly in the following characters: Leaves obovate, rounded and abruptly acuminulate or nearly truncate at apex, gradually narrowed at base into a petiole 1–2 mm. long, chartaceous, serrulate or ciliate-denticulate, midrib and veins above much impressed, elevated beneath, often rugulose above and veinlets prominent beneath, at maturity sparingly villous on the under surface or only near midrib beneath, sometimes nearly glabrous; inflorescence villous, at maturity sparingly villous (in the type specimen) or glabrous. With its subcoriaceous strongly veined leaves distinctly obovate and mostly rounded or nearly truncate at the apex, this variety looks quite distinct from the typical plant. The two numbers 507 and 2902 cultivated at the Arnold Arboretum have the leaves less strongly rounded at the apex and never truncate, and approach the typical plant.

× **Malus purpurea** (Barbier) Rehd. f. **Lemoinei** (Lemoine), comb. nov.

Malus floribunda Lemoinei Lemoine, Cat. no. **196**: 11 (1932).

Pyrus Lemoinei R. C. Notcutt ex Gard. Chron. ser. 3, **83**: 343, fig. 165 (p. 349) (1928).

This is apparently a form of *Malus purpurea* which is a hybrid between *M. pumila* var. *Niedzwietzkyana* (Dieck) Schneid. and × *M. atrosanguinea* (Spaeth) Schneid. It was raised by Lemoine and first mentioned in his Catalogue as cited above with a brief description. It is growing in this Arboretum and with its dark bronzy leaves and deep crimson flowers, is the most attractive of the group of hybrids belonging to *M. purpurea.*

Malus prunifolia (Willd.) Borkh. f. **pendula** (Bean), comb. nov.

Pyrus prunifolia Willd. var. *pendula* Bean, Trees Shrubs Brit. Isls. **2**: 291 (1914).

A form with pendulous branches in cultivation in the Kew Arboretum from which this Arboretum received scions for grafting in 1926.

Pyrus pyrifolia (Burm.) Nakai f. **Stapfiana** (Rehd.), comb. nov.

Pyrus sinensis sensu Stapf in Bot. Mag. **134**: t. 8226 (1908) pro parte, quoad plantam depict.; non Lindl.

Pyrus serotina var. *Stapfiana* Rehder in Proc. Am. Acad. Arts Sci. **50**: 233 (1916).

Since Nakai has shown that *Ficus pyrifolia* Burmann of which he saw the type specimens in the herbarium Delessert at Geneva, is an older name for *P. serotina* Rehd., the above new combination becomes necessary for this form distinguished by rather small pyriform fruit.

Pyrus Regelii, nom. nov.

Pyrus heterophylla Regel & Schmalhausen in Act. Hort. Petrop. **5**: 581 (1878), non Pott (1800), nec (Spach) Steud.

The name *P. heterophylla* Reg. & Schmalh. which fits this species with partly entire, partly pinnatifid to pinnatisect or trifid leaves very well, has unfortunately two older homonyms which make the name untenable, although the homonyms belong to different genera.

Pyrus heterophylla Pott in Du Roi, Harbk. Baumz. ed. 2, 318 (1800) is evidently a renaming of *P. hybrida* Moench and becomes a synonym of *Sorbaronia hybrida* (Moench) Schneider in Silva-Tarouca, Uns. Freiland-Laubgeh. ed. 2, 388 (1922). As author of *P. heterophylla* usually Du Roi is cited, but the second edition was issued after the death of Du Roi by his friend J. F. Pott who made additions to the original text indicated by being enclosed in brackets (cf. op. cit. pref. p. XI): *Pyrus heterophylla* is such an addition.

Pyrus heterophylla (Spach) Steudel, Nomencl. ed. 2, **2**: 423 (1841) is based on *Malus heterophylla* Spach, Hist. Veg. **2**: 138 (1834) which probably is, as suggested by Spach, a hybrid between *Malus pumila* and *M. coronaria,* as is also the opinion of Schneider (cf. Ill. Handb. Laubholzk. **1**: 719) who saw Spach's type. *Malus heterophylla* would then be the oldest name for this hybrid which also has originated independently in America and has often been confused with *Malus Soulardii* Brit. Here belongs "Matthew's Crab" and some other forms usually referred to *M. Soulardii.*

Potentilla fruticosa L. f. **Wardii,** nom. nov.

Potentilla fruticosa var. *grandiflora* Marquand in Jour. Linn. Soc. Bot. **48**: 175 (1929); non Willd. (1816).

Since the epithet given by Marquand is preoccupied by *P. fruticosa β. grandiflora* Willd. in Mag. Naturf. Fr. Berlin, **7**: 285 (1816), it must be changed and I propose to name it for the collector, Mr. F. Kingdon Ward.

Potentilla fruticosa var. **Friedrichsenii** (Spaeth) Rehd. f. **Beanii,** nom. nov.

Potentilla Friedrichsenii leucantha Spaeth in Mitt. Deutsch. Dendr. Ges. **19**: 286 (1910); Rep. Spec. Nov. **13**: 365 (1914).

Potentilla fruticosa var. *leucantha* Bean, Trees Shrubs Brit. Isls. **2**: 223 (1914). — Rehder, Man. Cult. Trees Shrubs, 423 (1927). — Non Makino (1910).

This white-flowered form is a seedling of var. *Friedrichsenii* which is a hybrid between typical *P. fruticosa* and var. *dahurica* (Nestl.) Ser. If *P. davurica* Nestl. is considered a distinct species, the binary name × *P. Friedrichsenii* Spaeth is the valid name for this hybrid and "*leucantha*" can stand as the name of a subdivision of this hybrid, but if transferred as a subdivision to *P. fruticosa,* it is invalidated by *P. fruticosa* var. *leucantha* Makino (in Bot. Mag. Tokyo, **24**: 32. 1910) which belongs to var. *mandshurica* Maxim.

Rosa pendulina L. var. **oxyodon** (Boiss.), comb. nov.

Rosa oxyodon Boissier, Fl. Or. **2**: 674 (1872). — Crépin in Bull. Herb. Boiss. **2**: 261 (1895).

Rosa alpina var. *oxyodon* (Boiss.) Boulenger in Bull. Jard. Bot. Bruxelles, **13**: 244 (1935).

Following R. Keller (in Ascherson & Graebner, Syn. Mitteleur. Fl. 6, **1**: 299. 1902) and others, I take *R. pendulina* to be the oldest name applicable to this species.

Rosa carolina L. var. **villosa** (Best) Rehd. f. **alba** (Rehder), comb. nov.

Rosa lucida var. *alba* Anon. in Am. Florist, **12**: 1098, fig. (1897). — Rehder in Bailey, Cycl. Am. Hort. **4**: 1554 (1902).

Rosa virginiana alba Willmott, Gen. Rosa, **1**: t. opp. p. 198 (1911).

Rosa Lyoni Pursh f. *alba* Rehder in Jour. Arnold Arb. **3**: 17 (1921) which see for further citations.

Since *R. Lyoni* Pursh is hardly separable from *R. carolina* as a distinct species, this white-flowered form which is undoubtedly a form of *R. Lyoni* must be classed under *R. carolina.*

Rosa chinensis Jacq. f. **mutabilis** (Corr.), f. nov.

Rosa mutabilis Correvon in Rev. Hort. **1934**: 60, pl.

This rose differs from *R. chinensis* chiefly in the color of the flowers which change from sulphur-yellow to orange and red and finally to crimson. The flowers are simple, 4.5–6 cm. across, with obovate petals; the leaflets are mostly oblong-ovate gradually acuminate and on the specimens before me up to 5 cm. long, those of the flowering branchlets smaller and comparatively broader. In the orange and yellow shades of the flowers, it resembles certain forms of *R. odorata* Sweet, but in all other characters it agrees with *R. chinensis.*

Prunus Amygdalus Batsch f. **variegata** (Schneid.), comb. nov.

Amygdalus communis foliis variegatis F. J. Schultz, Abh. Bäume Oestr. **1**: t. 24 (1792) ex Ind. Lond. **1**: 174. — Baum. Cat. ex Loudon, Arb. Frut. Brit. **2**: 675 (1838).

Prunus communis f. *variegata* hort. ex Zabel in Beissner, Schelle & Zabel, Handb. Laubholz-Ben. 235 (1903), nom. — Schneider, Ill. Handb. Laubholzk. **1**: 593 (1906).

A form with variegated leaves, apparently already known before 1800.

Prunus Amygdalus f. **purpurea** (Schneid.), comb. nov.

Prunus communis f. *purpurea* hort. ex Zabel, l. c. (1903), nom. — Schneider l. c. (1906).

A form with rose-purple flowers.

Prunus Amygdalus f. **roseo-plena** (Schneid.), comb. nov.

Amygdalus communis flore pleno F. J. Schultz, Abh. Bäume Oestr. **1**: t. 25 (1792) ex Ind. Lond. **1**: 174. — Baum. Cat. ex Loudon, l. c. (1838). — Carrière in Rev. Hort. **1875**: 370, t.

Prunus communis f. *rosea plena* Zabel, l. c. (1903), nom.

Prunus communis f. *roseo-plena* Schneider, l. c. (1906).

A form with double pink flowers, like the preceding known already before 1800.

Prunus Amygdalus f. **albo-plena** (Schneid.), comb. nov.

Prunus communis f. *alba plena* Zabel, l. c. (1903), nom.

Prunus communis f. *albo-plena* Schneider l. c. (1906).

A form with double white flowers.

Prunus tomentosa f. **leucocarpa**, f. nov.

A typo recedit fructibus albidis.

This form differing in its yellowish white fruits is growing in the Arnold Arboretum, plants having been presented to the Arboretum by Mr. H. P. Kelsey of East Boxford, Mass., in 1930. Specimens in herbarium Arnold Arboretum; coll. July 25, 1931 (fruit) and April 28, 1936 (flowers).

× **Prunus Skinneri** (*P. japonica* ♀ × *tenella*), hybr. nov.

Frutex ramulis brunneis, cortice tertio anno longitudinaliter fisso. Folia oblongo-ovata vel oblongo-lanceolata, 3.5–5.5 cm. longa, acuminata, basi late cuneata, interdum fere rotundata, argute subsimpliciter serrulata, dentibus mucronulatis partim denticulo unico instructis, supra sparse minuteque adpresse pilosula praesertim marginem versus, subtus ad costam pilosula, ceterum glabra; petioli puberuli 2–4 mm. longi. Flores coetanei, 2–3; pedicelli 1–2 mm. longi, puberuli ut calyx;

calycis tubus anguste campanulatus circiter 3 mm. longus; sepala tubum subaequantia vel paullo longiora, oblonga, reflexa, glanduloso-denticulata, intus extusque puberula; petala obovato-oblonga vel oblonga, supra medium dentata; stamina petalis dimidiis breviora; stylus petalis paullo brevior, in triente inferiore longe pilosus; ovarium minute dense pubescens. Fructus ovoideus, circ. 1 cm. longus, dense subadpresse villosus.

Cult. Manitoba Hardy Plant Nursery, coll. *F. L. Skinner,* spring 1938 (flower; type), Aug. 25, 1938 (fruit) (in herb. Arnold Arboretum).

This hybrid was raised by Mr. F. L. Skinner from seed of *P. japonica* Thunb. It is easily distinguished from that species by the narrower nearly simply serrate leaves, broadly cuneate at base with longer petioles, the very short pedicels, the narrow-campanulate calyx, narrower sepals and petals, the pilose style and the pubescent ovary and fruit. From *P. tenella* Batsch (*P. nana* Stokes, not Du Roi) it differs chiefly in the ovate-oblong, acuminate, closely and slightly doubly serrulate leaves, pubescent on the midrib beneath, in the short-stalked flowers and in the campanulate calyx.

× **Prunus Schmittii** (*P. canescens* ♀ × *avium*), hybr. nov.

Arbor parva, ramis erecto-patentibus cortice trunci rubro-brunneo, lenticellis magnis transversis, cortice ramorum in lamellas tenues solubili, ramulis hornotinis satis dense villosulis, annotinis rubro-fuscis glabris nitidulis. Folia elliptico-oblonga, 5–8 cm. longa, acuminata, basi late cuneata, dupliciter vel subsimpliciter serrata dentibus obtusiusculis, supra initio laxe adpresse pilosa, demum glabrescentia, subtus dense pilosa praecipue ad nervos, demum in facie sparse ad costam et venas laterales densius pilosa; petioli 1–2.5 cm. longi, graciles, initio pilosi, demum fere glabri. Flores 1–3, basi involucro sub anthesi persistente circumdata; pedicelli 1–1.5 cm. longi, sparse pilosi; calycis tubus campanulatus, 5–6 mm. longus, laxe pilosus; sepala ovata vel ovalia, circiter 2 mm. longa, fere integra, extus laxe pilosa, intus glabra, patentia vel reflexa; petala late ovalia vel obovato-orbicularia, alboroseа, 9–10 mm. longa; stamina dimidia petala aequantia; stylus glaber, stamina paullo superans. Drupa subglobosa, circ. 1 cm. diam., putamine laevi ovoideo.

Cult. in Arnold Arb.: no. 1548–23, coll. *A. Rehder,* June 3, 1935 (fruit) and May 10, 1937 (flowers; type).

This hybrid was raised in 1923 from seed of *P. canescens* Bois, from which it is at once distinguished by its tree-like habit, the much larger, less pubescent leaves on longer petioles, by the larger flower with campanulate calyx, broadly oval petals about 1 cm. long and by longer

pedicels surrounded at the base by a large conspicuous involucre. In its general aspect it approaches *P. avium* L., particularly in the serration and shape of the leaves, the campanulate calyx and the rather large flowers surrounded by a conspicuous involucre, but it is easily distinguished by the sparsely flaky bark of the branches, the pubescent branchlets, the persistent pubescence of the underside of the leaves and by the pilose pedicels and calyx. There are several trees of this hybrid growing in the Arboretum, now about 5 m. tall.

I take pleasure in naming this handsome hybrid after the superintendent of the Arnold Arboretum, Mr. Louis V. Schmitt, who has been connected with the Arnold Arboretum for 33 years.

Arnold Arboretum,
Harvard University.

ADDITIONAL NOTES ON CHINESE MYRTACEAE

E. D. MERRILL and L. M. PERRY

IN THE regular routine of naming collections received since the publication of The Myrtaceae of China,[1] we have noted the following range-extensions and additional species.

Baeckea frutescens Linn. var. **brachyphylla** var. nov.

A forma typica differt foliis latioribus obtusisque, 4–6 mm. longis.

KWANGSI: without definite locality, *Wang 39952*.

Although *Wang 39952* (collection in fruit only) may be specifically distinct, we are designating it as a variety of *B. frutescens* L. distinguished by blunt leaves rarely more than 6 mm. long and usually 1 mm. broad. The typical form of the species is characterized by pointed leaves 6–10 mm. (or more) long and 0.5 mm. broad.

Syzygium latilimbum (Merr.) Merr. & Perry, Jour. Arnold Arb. **19**: 216. 1938.

YUNNAN: Fo-Hai, *Wang 74649;* Meng-ban, Shan-hsien, Fo-hai Hsien, *Wang 76203;* Dah-meng-lung, Che-li Hsien, *Wang 76343, 77877;* Sheau-meng-yeang, Che-li Hsien, *Wang 75837;* You-louh-shan, Che-li Hsien, *Wang 78148;* Kuen-ger, Che-li Hsien, *Wang 79217;* Lan-Tsang Hsien, *Wang 76538, 76691;* Tsang-Yuan, *Wang 73283*.

Previously reported from Hainan with one collection from Yunnan as possibly representing the same species.

Syzygium Nienkui Merr. & Perry, op. cit. 228.

KWANGSI, without definite locality, *Wang 39029*. Hainan.

Syzygium oblatum (Roxb.) A.M. & J.M. Cowan, Trees North. Bengal 68. 1929; Merr. & Perry, Jour. Arnold Arb. **19**: 101. 1938 (Wall. List, no. 3569. 1831, *nomen nudum*).

Eugenia oblata Roxb. Fl. Ind. ed. 2, **2**: 493. 1832; Kurz, For. Fl. Brit. Burma **1**: 488. 1877; Duthie in Hooker f. Fl. Brit. Ind. **2**: 492. 1878; King, Jour. As. Soc. Bengal **70**(2): 114. 1901; Craib, Fl. Siam. Enum. **1**: 652. 1931.

Eugenia reticulata Wight, Ill. **2**: 16. 1841, Ic. **2**: *t. 541*. 1843.

Syzygium reticulatum Walp. Repert. **2**: 179. 1843.

[1] Jour. Arnold Arb. **19**: 191-247. 1938.

YUNNAN: Fo-Hai, *Wang 76125,* July, 1936, at 1300 m. alt.; Meng-pung, Jenn-yeh Hsien, *Wang 80408,* October, 1936, at 800 m. alt.; Che-li Hsien, *Wang 75557,* August, 1936, at 950 m. alt.; Maan-bang, Dah-meng-lung, Che-li Hsien, *Wang 77440,* at 980 m. alt.

Type from Chittagong. Indo-China, Annam, Burma, Siam, the Malay Peninsula and Borneo.

By scanning our herbarium collections from India for species which might also occur in Yunnan, we found three specimens (*Prain's collector 799, King's collector s. n.*, and no. *11161* collected by the Reporter on Economic Products to the Government of India), labeled *Eugenia reticulata* Wight, which agree very well with our somewhat fragmentary Yunnan material. These also do not appear to be separable from the more widely known *E. oblata* Roxb. *Eugenia reticulata* Wight has long since dropped into synonymy.

Syzygium Thumra (Roxb.) comb. nov.

Eugenia Thumra Roxb. Fl. Ind. ed. 2, **2**: 495. 1832; Wight, Ic. **2**: *t. 617.* 1843; Kurz, Jour. As. Soc. Bengal **46**(*2*): 67. 1877, For. Fl. Brit. Burma **1**: 488. 1877; Duthie in Hook. f. Fl. Brit. Ind. **2**: 481. 1878; Brandis, Ind. Trees 321. 1906.

Syzygium speciosum Wall. List, no. 3568. 1831 (fide Duthie), *nomen nudum.*

YUNNAN: Dah-meng-lung, Che-li Hsien, *Wang 77665,* August, 1936, at 950 m. alt.; Meng-pung, Jenn-yeh Hsien, *Wang 78930,* October, 1936, at 800 m. alt.

Type from Pegu, Burma.

This is only a tentative determination to call attention to these two fruiting collections. All our material from India is in flower. Although the leaves, the petioles and the bark of the branches compare favorably in both the Indian and the Chinese specimens, the difficulty of matching with any degree of surety flowering and fruiting collections even from neighboring regions is great and must always be borne in mind.

Syzygium Bullockii (Hance) Merr. & Perry, op. cit. 107, 238.

KWANGSI: *Liang 70107.* Kwangtung, Hainan, Indo-China.

Syzygium euonymifolium (Metcalf) Merr. & Perry, op. cit. 242.

KWANGSI, *Liang 69921.* Kwangtung.

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A REVIEW AND EXTENSION OF OUR KNOWLEDGE OF CALYPTOSPORA GOEPPERTIANA KUEHN

J. H. FAULL

OUR KNOWLEDGE of the haploid phase of *Calyptospora Goeppertiana* on *Abies* dates from 1805 and of the diploid phase on *Vaccinium* from 1869. That the latter was not recognized earlier is readily understood because there are no uredia, and because the teliospores are intraepidermal with no suggestive external indications of their presence. In 1880, Robert Hartig (13) announced that he had proved the connection of the two phases by means of culture experiments. His findings have been confirmed repeatedly.

Calyptospora Goeppertiana is of special interest not only for its lack of uredia but also for its reduced spermogonia. Indeed, the latter were long supposed to be absent. They do occur, however, and often in considerable numbers. But they are aborted to a greater or less extent and, so far as Hunter (15) could determine from a thorough study of the rust on *Abies balsamea,* they do not form spermatia nor do they rupture. On the other hand, Weir (21) reported normal spermogonia and spermatia for *C. Goeppertiana* on *A. lasiocarpa.* If that occurrence is representative for the rust in western North America, then it differs from what is known of it in Europe and eastern North America. Before re-defining the species, however, Weir's observations should be checked against those made on unquestionably authentic *C. Goeppertiana,* preferably from cultures on *A. lasiocarpa* in which telial material from Europe or eastern North America would be used as inoculum.

Another feature of interest concerning *C. Goeppertiana* is its phylogeny. Plainly, as has been maintained by Faull (9) and others, the characteristics of its spermogonia, aecia and teliospores suggest a close relation to *Pucciniastrum.* From a comparative investigation of the ontogeny of the teliospores in the various genera of the Pucciniastreae, Pady (19), while recognizing the resemblance of *Calyptospora* to *Pucciniastrum,* inclines to the view that they may be analogous genera in parallel evolutions. He concludes — "These results agree in a very general way with the phylogenetic tree that Faull has constructed for the *Pucciniastreae,* except for the possibility that the two lines of development indicated above might represent two phylogenetic series. In that case,

the phylogenetic tree would possess two main branches, the one leading through the intra-epidermal forms, *Milesia, Hyalopsora, Thecopsora* and *Calyptospora,* and the other passing through the subepidermal genera *Pucciniastrum* and *Melampsoridium,* to such forms as *Melampsora.* Many more data would be necessary, however, before this series could be postulated as a phylogenetic one."

Economically, *C. Goeppertiana* is probably not of great importance. Yet I have found it on seedlings of *Abies balsamea* in the forest in such abundance as to indicate some effect on the natural reproduction of that species. Weir (21) also reports that in the western United States it is injurious to various species of *Vaccinium.* But so far no exact investigation seems to have been made on that aspect of the rust.

This paper deals with four topics relative to *C. Goeppertiana,* namely, (1) nomenclature and taxonomy, (2) life history studies, (3) hosts, (4) specimens examined.

NOMENCLATURE AND TAXONOMY

Calyptospora Goeppertiana Kühn in Hedw. **8:** 81 (1869). (III).

Aecidium columnare Albertini & Schwein. Consp. Fung. Lusat. 121 (1805). (I).

Peridermium columnare Kze. & Schm. Deutschl. Schwämme no. 10 (1815). (I).

Caeoma columneum Link in W. Spec. Pl. **6, 2:** 66 (1825). (I).

Uredo columnaris Spreng. Syst. Veg. **4, 1:** 570 (1827). (I).

Melampsora Goeppertiana Wint. in Rabenhorst, Krypt.-Fl. ed. 2. **1:** 245 (1884).

Melampsora columnaris Wettst. in Verhandl. Zool.-Bot. Ges. Wien, **35:** 551 (1885).

Calyptospora columnaris Kühn in Rabenh.-Wint. Fung. Eur. no. 3521 (1886).

Pucciniastrum Goeppertianum Kleb. Wirtswechs. Rostpilze, 391 (1904).

Thecopsora Goeppertiana Hiratsuka in Jour. Soc. Agric. Forestr. Sapporo, **19:** 167 (1927).

After it was experimentally demonstrated that *Aecidium columnare* A. & S. on *Abies* and *Calyptospora Goeppertiana* Kühn on various species of *Vaccinium* are the haploid and the diploid phases, respectively, of the same species, the nomenclatural history of this rust has mainly revolved around the proper choice of the specific and the generic names. The authoritative specific name was settled eventually by Article 49 *bis* of the rules adopted by the International Botanical Congress of 1910. The choice of generic name is still subject to differences of opinion.

Just what generic name should be adopted depends on breadth of interpretation and on the measure of regard for long established usage.

Three names are involved, namely, *Calyptospora, Pucciniastrum, Thecopsora*. Morphologically, the rusts variously referred to these genera are similar with respect to their aecia and teliospores. This fact has been deemed sufficient by some systematists to warrant the inclusion of all of them under *Pucciniastrum,* a name which has priority over the other two. Another view is held to the effect that a separation of these rusts should be made according to whether their teliospores are subepidermal or intraepidermal. Under that disposition they are distributed between the respective genera *Pucciniastrum* and *Thecopsora*. But many uredinologists prefer to retain *C. Goeppertiana* under the generic name *Calyptospora,* partly because of long established usage, as so frankly admitted by Sydow (20), and partly because *C. Goeppertiana* is characterized by such important distinctive features as more or less aborted, apparently non-functional spermogonia, lack of uredia, cauline teliospores and indeterminate telia which occupy the entire epidermides of "broomed" stems.

Up to this point the synonymy involved centers on what is universally regarded as the same fungus. Quite recently, however, Arthur (2) has added two synonyms concerning which there may be some question of fungus identity, namely, *Peridermium ornamentale* Arthur (in Bull. Torr. Bot. Club, **28**: 665. 1901) and *P. Holwayi* Sydow (in Ann. Mycol. **1**: 19. 1903). The former was collected Sept. 4, 1900 on Mt. Paddow, Washington at an elevation of about 6000 feet on first year needles of *Abies lasiocarpa*. The latter was described from material collected Aug. 11, 1901 at Glacier, B. C., on second year needles of *A. lasiocarpa*. After careful study of the types, I am convinced that neither is *Calyptospora Goeppertiana*, and that both are probably specifically distinct from each other. Table 1 presents the data on which these conclusions are based.

In this connection it should be noted that the usual practice in herbaria nowadays is to label specimens of these rusts from the western United States and western Canada with the name *Peridermium ornamentale*, regardless of whether the peridermia are on first or second year needles. No recognition is being given to *P. Holwayi* other than to regard it as a synonym. According to the present state of our knowledge, this procedure is without warrant. In short, I tentatively agree with the opinion expressed by Boyce (6) that *P. ornamentale,* as now generally interpreted, "is undoubtedly a composite species, because Peridermia with aecia on the current season's needles and others with aecia on the one-year-old needles are so named."

Just what the diploid phases of *Peridermium ornamentale* and *P.*

TABLE 1

COMPARISON OF CALYPTOSPORA GOEPPERTIANA, PERIDERMIUM ORNAMENTALE AND P. HOLWAYI

	Calyptospora Goeppertiana on *Abies balsamea* (Culture)	*Peridermium ornamentale* on *Abies lasiocarpa* (Type)	*Peridermium Holwayi* on *Abies lasiocarpa* (Type)
Position of spermogonia	Hypophyllous	Amphigenous, but mostly hypophyllous	Amphigenous; abundant on both surfaces
Condition of spermogonia	More or less aborted and apparently not functional	Not aborted and apparently functional	Not aborted and apparently functional
Limits of size of spermogonia	13–30 × 42–137μ	32–54 × 81–175μ	27–54 × 68–138μ
Average size of spermogonia	21 × 73μ	40 × 126μ	35 × 98μ
Occurrence of peridermia	1st year needles Hypophyllous	1st year needles Hypophyllous	2nd year needles Hypophyllous
Seasonal occurrence of peridermia	Early summer of first year	Late summer or early autumn of first year	Summer or late spring of second year
Shape and size of peridermia	Slender, terete	Robust, cylindrical to compressed cylindrical	Robust, compressed cylindrical
Average size of aeciospores	16 × 20μ	14 × 20μ	18 × 23μ

Notes:

(1) Spermogonia of all three are flattened convex, subcuticular.
(2) The occurrence of the spermogonia as hypophyllous or amphigenous might possibly vary according to the host species, just as was found by Faull (10) to be true of *Milesia fructuosa*.
(3) The average size of the spermogonia might possibly vary within fairly wide limits. This could be determined only by the examination of many collections of authentically named specimens.
(4) The robustness and the shape of the peridermia might possibly vary according to the host species or according to nutritional and environmental factors.
(5) Whether or not a rust might form its peridermia in the latter part of the first year or the early part of the second year, depending on seasonal or other factors, is unknown. But so far this has never been demonstrated for any species. If it be true of *P. ornamentale* or *P. Holwayi*, then one important reason would be removed for regarding them as distinct species.

Holwayi may be, remains for cultural determination. Their characteristics, however, indicate a Pucciniastrum relationship. Such, too, is Boyce's view (5), although his surmise, based on field associations of the rusts, that *Pucciniastrum Myrtilli* on *Vaccinium* is the diploid phase of *Peridermium ornamentale* is quite improbable. *Pucciniastrum Myrtilli* is known to have *Tsuga* as its alternate host, and all attempts so far to culture it on *Abies* have failed. If *Peridermium ornamentale* does infect *Vaccinium,* then the resulting diploid phase might resemble that of *Pucciniastrum Myrtilli;* but with at least equal likelihood it might resemble that of *Calyptospora Goeppertiana.* The same applies to *Peridermium Holwayi.* That there may be a second species of *Calyptospora,* as yet unnamed, in western North America has already been suggested by Weir (21) in his comparative study of what he took to be *Calyptospora Goeppertiana.* His conclusion was influenced solely by differences in the shape and the robustness of the peridermia characteristic of *C. Goeppertiana* and *P. ornamentale.* He expressed himself as follows — "It is here proposed to reverse an earlier view on the identity of the aecial form on *Abies* with large cylindrical or flattened peridia and suggest the probability of there being another species of *Calyptospora* with telia on *Vaccinium.* This suggestion is based purely on field observations. All collections of the large aecial form so far made by the writer have been in close association with the typically appearing telial stage on *Vaccinium.* Wherever the large aecial form has been collected the form with small cylindrical peridia has been absent, with the reverse as true." He adds, — "Another view," apparently not his own, "would be that the size of the aecia is influenced by the vigor of the host and that the two forms are identical." Incidentally it should be remarked that if there be a second species of *Calyptospora* on *Vaccinium* in western North America, then the collections labelled *C. Goeppertiana* from that part of the world are subject to revision.

Here, then, is a simple, well defined problem in western North America that can be solved by making suitable cultures — the problem of adequately defining the rusts included under the names *Calyptospora Goeppertiana, Peridermium ornamentale* and *Peridermium Holwayi.*

LIFE HISTORY STUDIES

Several successful life history studies have been made of *Calyptospora Goeppertiana.* Robert Hartig (13, 14) cultured it from *Vaccinium Vitis-idaea* on *Abies alba,* and then in the reverse direction. He made no mention of spermogonia. Kühn (16, 17, 18) then cultured it from *V. Vitis-idaea* on *Abies alba, A. balsamea, A. cephalonica, A. cilicica,*

A. concolor, A. Fraseri, A. magnifica, A. nobilis, A. Nordmanniana, A. Pinsapo, A. sibirica and *A. Veitchii.* He also made no mention of spermogonia. Bubák (7, 8) cultured it from *V. Vitis-idaea* on *A. alba.* No spermogonia were recognized. Arthur (1) cultured it from *V. pennsylvanicum* on *A. Fraseri.* He remarked, "pycnia rarely if ever found." Fraser (11, 12) cultured it from *V. pennsylvanicum* on *A. balsamea.* No spermogonia were recognized. He also inoculated *Tsuga canadensis* with telial material, but the results were negative. Weir (21)* cultured a rust, which he took to be *C. Goeppertiana,* from *A. lasiocarpa* on *V. membranaceum.* In other experiments he cultured the rust from brooms of *V. membranaceum* on *A. lasiocarpa,* and also carried it forward from *Vaccinium* to *Vaccinium* by making infected tissue plantings. Finally, I have made many cultures on *A. balsamea,* using as inoculum telial material from *V. pennsylvanicum* and *V. canadense.* Summaries of my experiments are recorded in Tables 2 and 3 of this paper.

TABLE 2

CULTURES OF CALYPTOSPORA GOEPPERTIANA
FROM VACCINIUM PENNSYLVANICUM TO ABIES BALSAMEA

1. *Forty-five inoculation experiments* were made; all gave *positive* results.
2. The dates of inoculation ranged from June 8 to June 20.
3. Yellowing of the needles appeared 12 to 17 days after inoculation. *The average was 14 days.*
4. Spermogonia were first observed 13 to 19 days after inoculation. *The average was 16 days.*
5. The peridermia were first observed 17 to 24 days after inoculation. *The average was 21 days.*
6. The peridermia began to rupture one to five days following their first appearance.
7. The production of peridermia was practically completed within 32 days after inoculation. *The average was about 29 days.*

*Through the courtesy of the United States Bureau of Plant Industry I have had the opportunity of examining an unused part of Weir's aecial inoculum from *Abies lasiocarpa,* and also meager infections on *A. lasiocarpa* that resulted from his inoculations with telial material of *Vaccinium membranaceum* origin. I would be hesitant, however, to unreservedly pronounce either as *Calyptospora Goeppertiana.* Spermogonia do occur on both of them, though with comparative scantiness. No distinctly aborted spermogonia were found; but I could not determine whether or not spermatia were produced. Certainly the peridermia are more robust than those characteristic of *C. Goeppertiana* on *Abies balsamea* and not less so than some of *Peridermium ornamentale.* Moreover, the first material referred to above was collected after the middle of September, which suggests a long developmental period as compared with the few weeks required for the development of *C. Goeppertiana* on *A. balsamea.*

8. The number of infected needles with peridermia varied from 6 to 203. *The average was 70.*
9. The number of peridermia per needle varied from 22 to 41. *The average was 27.*
10. J. H. Faull Herbarium nos. 7269–7279, 7403 and 8116–8132.

TABLE 3

CULTURES OF CALYPTOSPORA GOEPPERTIANA
FROM VACCINIUM CANADENSE TO ABIES BALSAMEA

1. *Three inoculation experiments* were made; all gave *positive* results.
2. The date of inoculation was June 22.
3. Yellowing of the needles appeared 11 to 13 days after inoculation. *The average was 12 days.*
4. The spermogonia were first observed 13 to 15 days after inoculation. *The average was 14 days.*
5. The peridermia were first observed 21 days after inoculation.
6. The peridermia began to rupture two days following their first appearance.
7. The production of peridermia was practically completed within 25 days after inoculation.
8. The number of infected needles with peridermia varied from 75 to 108. *The average was 90.*
9. The number of peridermia per needle varied from 27 to 41. *The average was 33.*
10. J. H. Faull Herbarium nos. 8133–8135.

HOSTS

The haploid phase of *Calyptospora Goeppertiana* has been shown by cultures to have as hosts the following species of *Abies* — 1. *Abies alba* Mill. 2. *A. balsamea* (L.) Mill. 3. *A. cephalonica* Loud. 4. *A. cilicica* Carr. 5. *A. concolor* Lindl. & Gord. 6. *A. Fraseri* (Pursh) Lindl. 7. *A. lasiocarpa* Nutt. 8. *A. magnifica* A. Murr. 9. *A. nobilis* Lindl. 10. *A. Nordmanniana* Spach. 11. *A. Pinsapo* Boiss. 12. *A. sibirica* Ledeb. 13. *A. Veitchii* Lindl. Other species of *Abies* have been recorded as hosts but they have not been confirmed by cultures. It would seem probable, however, from this list that most, if not all, species of *Abies* are susceptible to *C. Goeppertiana*.

The diploid phase of *C. Goeppertiana* occurs on the following species of *Vaccinium* — 1. *Vaccinium canadense* Kalm. 2. *V. corymbosum* L. 3. *V. Myrtillus* L. 4. *V. pennsylvanicum* Lam. 5. *V. vacillans* Kalm. 6. *V. Vitis-idaea* L. 7. *V. Vitis-idaea* var. *minus* Lodd.

Many species from western North America are also recorded as hosts of *C. Goeppertiana*. But, for reasons already expressed, the determinations may be subject to revision. Nevertheless it is probable that they, too, may serve as hosts for this rust. The list is as follows — *Vaccinium caespitosum* Michx., *V. Chandleri* Jepson, *V. erythrococcum* Rydb., *V. membranaceum* Dougl., *V. microphyllum* Rydb., *V. oreophilum* Rydb., *V. ovalifolium* Sm., *V. ovatum* Pursh, *V. parvifolium* Sm., *V. scoparium* Leib.

SPECIMENS EXAMINED

O and I. On *Abies alba*.

GERMANY: München, July 1910, J. H. Faull.

O and I. On *Abies balsamea*.

NOVA SCOTIA: Card Lake, July 21, 1929, J. H. Faull. — Mahone, July 22, 1929, J. H. Faull. — Liscomb Park, July 30, 1929, J. H. Faull.

ONTARIO: Timagami, July 4, 16, 25, 1919, J. H. Faull. — Timagami, July 10–16, 1924; CULTURES from *Vaccinium pennsylvanicum* by J. H. Faull and W. G. Watson. — Timagami, July 11, 1925; CULTURES from *V. pennsylvanicum* by E. H. Moss. — Timagami, July 16–19, 1926; CULTURES from *V. pennsylvanicum* by J. H. Faull and G. D. Darker. — Timagami, July 17–18, 1926; CULTURES from *V. canadense* by J. H. Faull and G. D. Darker. — Timagami, July 12, 1927, G. D. Darker 2041.

III. On *Vaccinium canadense*.

MAINE: Eustis, Oct. 23, 1931, J. H. Faull.

ONTARIO: Timagami, Aug. 19, 1921, J. H. Faull. — Timagami, May 12, 1924, J. H. Faull.

QUEBEC: Mt. Albert, Gaspé Co., Aug. 21, 1933, J. H. Faull.

III. On *Vaccinium pennsylvanicum*.

MAINE: Eustis, Oct. 23, 1931, J. H. Faull. — Solon, Aug. 27, 1935, J. H. Faull.

NEW HAMPSHIRE: Mt. Jefferson, Aug. 31, 1932, J. H. Faull.

NOVA SCOTIA: Card Lake, July 21, 1929, J. H. Faull. — Liscomb Park, July 30, 1929, J. H. Faull.

ONTARIO: Timagami, July 5, 16, 29, 1919, J. H. Faull. — Timagami, June 18, 1923, J. H. Faull. — Timagami, July 8, 1924, J. H. Faull. — Timagami, May 31, 1925, J. H. Faull.

III. On *Vaccinium Vitis-idaea*.

ALBERTA: Mercoal, Aug. 8, 1925, W. R. Watson.

JAPAN: Mt. Oakan, Prov. Kushiro, Aug. 21, 1926, N. Hiratsuka 546.

III. On *Vaccinium Vitis-idaea* var. *minus*.

NEW HAMPSHIRE: Mt. Jefferson, Aug. 31, 1932, J. H. Faull.

SUMMARY

1. A review of the literature indicates that thirteen species of *Abies* have been proved by experiments to be susceptible to *Calyptospora Goeppertiana* Kühn. None are known to be immune.

Likewise, many species of *Vaccinium* have been recorded as hosts of *C. Goeppertiana*. A few of them have been used in making life history studies of the rust, namely, *V. Vitis-idaea*, *V. pennsylvanicum* and possibly *V. membranaceum* by previous investigators, and *V. pennsylvanicum* and *V. canadense* by the writer.

2. Life history studies made by the writer are summarized in Tables 2 and 3 of this paper. In these, *C. Goeppertiana* was successfully passed from *Vaccinium pennsylvanicum* and *V. canadense* to *Abies balsamea*.

3. *Peridermium ornamentale* Arthur and *P. Holwayi* Sydow, more recently held to be synonymous with *C. Goeppertiana* Kühn, are compared (Table 1) with one another and with the haploid phase of *C. Goeppertiana*. The disagreements noted lead to the conclusion that they are probably distinct forms and that neither is *C. Goeppertiana*. The diploid phases of *P. ornamentale* and *P. Holwayi*, interpreting these forms from their type specimens, have not yet been demonstrated.

4. So far, one species only of *Calyptospora* has been described. If, however, *P. ornamentale* and *P. Holwayi* should prove to be as yet unnamed species of *Calyptospora*, then the identification of collections from western North America, now passing under the name *C. Goeppertiana*, is subject to revision. The answer awaits culture experimentation.

5. The record of specimens studied in connection with the preparation of this paper extends our knowledge of the geographical distribution of *C. Goeppertiana* and gives recognition to *V. Vitis-idaea* var. *minus* Lodd. as a host of that rust.

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THYRONECTRIA DENIGRATA (WINTER) SEAVER, THE CAUSE OF DISEASE IN GLEDITSIA

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TWO HERETOFORE UNDESCRIBED DISEASES of *Gleditsia* have been studied by the writer during the past three years. One is a wilt of *G. japonica* Miq. and the other a canker of *G. triacanthos* L. The former is certainly caused by *Thyronectria denigrata* (Winter) Seaver (*Pleonectria denigrata* Winter), a fungus so far recognized as a saprophyte only, and the latter seems to be caused by the same fungus. The wilt disease was observed in the Arnold Arboretum, and the canker on Nantucket Island, Massachusetts.

Gleditsia japonica is represented in the Arnold Arboretum by a few trees raised from seed of Korean origin, received in 1904. These trees grew well. But in May 1933 one of them suddenly wilted and died. A second one died similarly in October 1937 and a third in August 1938. The symptoms throughout resemble those of the Dutch Elm Disease both as to wilting of the foliage and discoloration of the wood. The discoloration is of a red-orange color (Bittersweet Orange darkening on air exposure to Grenadine Red, Ridgway).

Cultures from the stained areas in all cases developed the same fungus. On potato-dextrose agar this appears first as a low mat of fine white mycelium which later produces from simple conidiophores many small, single-celled, oval, hyaline spores. Soon parts of the agar surface become covered with a wettish orange-colored mass of spores and these bud much in the manner of yeasts. This phase might be classified as a *Sporotrichum*. As the cultures dry out, provided they are exposed to light, the mycelium balls up to form white, felted, botryoidal pycnidia with black top-surfaces which crack and exude orange-colored cirri of spores of the same size and shape as spores newly borne on the earlier hyaline conidiophores. Cultures kept in the dark do not show pycnidia and the color of the mycelium appears yellower.

Logs cut from the diseased trees showed after a few weeks pycnidia with cirri of orange spores but produced on stromata which protruded through the lenticels. Spores from these grew in culture exactly as did the isolations from discolored wood. The stromata and pycnidia and

cultural characteristics are identical in every way with those of stages of *T. denigrata* from *G. triacanthos*.

Numerous attempts to produce ascospores in culture have not been successful. Single ascospore cultures of *T. denigrata* have been made, however, and all details of growth of the fungus up to the production of pycnidia on large stromata have been found exactly similar in fungi from both sources. Moreover, immature perithecia like those of *Thyronectria* have been found on overwintered branches of the diseased *G. japonica*. Experimental proof was obtained by inoculating 30 seedlings of *G. japonica*. Forty per cent of the seedlings became infected and soon died. *Thyronectria denigrata* was readily isolated from the discolored wood and no other fungus was present. From the facts that the trees in question died suddenly, that discoloration and hyphal threads were found throughout the same annual ring of the trunk and branches, and that they were limited to the vessels, it is deduced that once infection starts the fungus is a very active parasite in *G. japonica*. Small conidia seen in the vessels no doubt hasten the spread of mycelium in the tree.

In the literature *T. denigrata,* though often collected on American gleditsias, has not been suspected of being a parasite. However, the author has observed many trees of *G. triacanthos* on Nantucket Island where some signs of parasitism following severe winters were apparent. In some instances fatalities resulted. Cankers were the conspicuous symptoms and no wilting was observed. In these trees at the border of infected wood was a red-orange line of demarcation localized to the canker, and not widespread as in *G. japonica*. Cultures indicated that *T. denigrata* was the causal organism.

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THE VEGETATIVE PROPAGATION OF DIFFICULT PLANTS

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With plates 228–231

INTRODUCTION

PROPAGATORS and gardeners have long been familiar with the fact that certain plants are readily propagated from cuttings, while others are not. The latter, which may be termed "difficult" or "resistant" plants, belong to many taxonomic orders, and there is no reason to associate their failure to form roots with any anatomical peculiarities. The discovery of the rôle of hormones in root initiation and the identification of the auxins as the substances primarily concerned (for literature see Went and Thimann, 1937) led of course to the supposition that failure to root was due to an insufficient supply of auxin. Hence the application of auxin to cuttings of such plants should induce root formation. In part this expectation was justified. Application of auxin in suitable concentration both hastens root development and increases the numbers of roots formed, on most plants which are capable of rooting at all. The list of plants for which data on the promotion of root formation by auxin treatment have been given is now very large (Chadwick, 1937; Cooper, 1935, 1938; Gočolašvili and Maximov, 1937; Hitchcock and Zimmerman, 1936; Laibach and Fischnich, 1935; Müller, 1935; Poesch, 1938; Pearse and Garner, 1937; Pearse, 1938; Traub, 1938; Went, 1934).

Nevertheless, it was soon found that many of the most resistant plants, which ordinarily are never propagated by cuttings, are not even induced to form roots by auxin treatment. So far as trees are concerned, these plants comprise three main groups: — (1) a majority of the conifers, (2) many forest hardwoods, (3) the apples and related rosaceous trees. There are a number of others. Evidently failure of these cuttings to root is not primarily due to insufficient auxin supply, and this is *a priori* reasonable, because we know that auxin is universally present at least in the spring and during the period of growth, so that if auxin supply were the controlling factor cuttings of "difficult" plants should at least root when taken at this time of year.

We have therefore considered it of importance to make a general

*This work was made possible by a grant from the Maria Moors Cabot Foundation for Botanical Research.

study of the rooting of "difficult" plants, particularly since our present knowledge of auxin relations, and the unlimited availability of pure synthetic auxins, make it possible to control this one factor adequately. The study was made more urgent because the work of the Maria Moors Cabot Foundation involves the selection and breeding of conifers and forest trees, many of which fall into groups (1) and (2) of the above classification of "difficult" plants.

Much of our work has centered upon white pine (*Pinus Strobus*) but the principles brought to light have in each case been tested on other conifers and hardwoods. Data on the third group of trees will not be included in this first report.

Occasional reports of the rooting of cuttings of white pine and other *Pinus* species have appeared in the literature (see, for instance, Mirov, 1938, and literature there cited). Such reports are of little use for our purposes, however, firstly because quantitative data on the percentage of cuttings which rooted are rarely, if ever, given, and secondly because the exact conditions which brought about rooting on the particular occasion reported, as opposed to the numerous and widespread failures, are not investigated. In order to be of use for selection work, rooting must be under control and must be at least partially quantitative. As far as possible, therefore, we have attempted to define our conditions and to report all data quantitatively. Repetition of the experiments elsewhere should involve no difficulty.

In the course of the work a few trees have been found which are in fact readily rooted by auxin treatment alone. The most notable of these is the Canadian hemlock (*Tsuga canadensis*). *Picea pungens* behaves similarly. Successful rooting of white pine and others involves, however, other considerations.

The factors mainly studied have been:—

(1) The age of the tree from which cuttings are taken. This is by far the most important single factor.

(2) Optimal auxin treatment.

(3) The relative rooting behavior of different parts of the plant.

(4) Rooting medium and temperature, including treatment of the bases of the cuttings with hot water or permanganate.

(5) Factors other than auxin, namely, sugar and vitamin B_1.

MATERIAL AND METHODS

All cuttings unless otherwise specified were of wood in its first year of growth, i.e. from 4 months up to one year old, or "one-year wood."

Cuttings of *Pinus Strobus, Tsuga canadensis* and its variety *pendula, Taxus baccata* and its variety *repandens, Picea Abies* and *Picea pungens* were obtained from trees of known age at the Arnold Arboretum. Those from young trees were obtained in part from the Harvard Forest Nursery (courtesy of Dr. Paul R. Gast) and in one case from a commercial grower. Cuttings of *Keteleeria Davidiana* Beiss. were from a tree about 10 years old at Cambridge. All were taken at the base of the one-year growth.

Hardwoods. Cuttings of *Fraxinus americana* were obtained from trees of known age at the Arnold Arboretum. Young trees of *Acer platanoides* as well as cuttings from old trees of *Populus nigra* var. *italica* and *Populus grandidentata* were collected in the vicinity of Cambridge. Young trees of *Quercus borealis* were obtained commercially. As far as possible all were taken with a "heel" at the base of the one-year wood.

Treatment. The cuttings were placed with their bases immersed 1–2 cm. deep in the auxin solution or water at room temperature for 24 hours, rinsed and placed in propagating boxes. Unless otherwise stated, the auxin used was indole-3-acetic acid (Eastman or Hofmann-La Roche). Sugar and other treatments are described below. The boxes were of cypress, fitted with a hinged glass cover which was generally kept nearly closed. During the summer the boxes were covered with two thicknesses of cheesecloth to reduce the light. The boxes were kept in the greenhouse with a minimum winter temperature of 60 F (15 C). The bottom was covered with coarse gravel to a depth of one inch, then by about 5 inches of sand, sand-peat mixture or pure peat. The mixture was found the most practical on the whole. Bottom heat, where used, was supplied by means of a G. E. unit no. 69×787. The medium was kept as moist as possible consistent with good aëration.

The experiments were carried out, in most cases, by dividing a group of several hundred cuttings into smaller groups each of which received a different treatment. For example, 300 cuttings might be divided into 4 groups of 75 for different auxin concentrations, and each of these subdivided into 3 groups of 25 to compare peat, sand and peat-sand mixture as rooting medium. Though the final number in any one group was thus small, the effect of any treatment can be determined from quite a large number of cuttings by adding together all those receiving that treatment in the different groups. This procedure, which must, of course, be applied with discretion, allows the effects of a number of variables to be surveyed. The important points can then be checked by separate experiments.

Since some 50,000 cuttings have been studied in small groups in this way it will not be possible to give the whole of the data in undigested form, but the principal conclusions and the evidence for them will be presented.

RESULTS

1. The age of the plant

A large number of experiments with both soft and hard wood cuttings of *Pinus Strobus* (white pine) and *Quercus borealis* (red oak) taken from mature trees at different times of the year, treated with various concentrations of auxin up to 400 mg. per liter and kept in different rooting media, showed that in no case was there an appreciable percentage of rooting. The cuttings often survived for months, sometimes with development of buds or leaves, but eventually withered. It was not until attention was turned to cuttings from young trees that satisfactory rooting was attained.

It was then found that cuttings of white pine taken from trees two or three years old rooted rather quickly even without auxin treatment. With auxin the rooting was somewhat hastened and the percentage of cuttings rooting greatly increased. The results of a number of experiments on cuttings from trees of different ages are summarized in table 1.

It is clear that the percentage of rooting in water controls decreases steadily with increasing age. Cuttings from the older trees will not root appreciably whether treated with auxin or not. The rooting reported by Mirov (1938) from ten-year old trees must have either been in extremely low percentage*, or else his conditions were in some way more favorable than ours. Cuttings from the very young plants root readily. There is an intermediate age of about 3 years in which water controls root sparingly, but the percentage may be raised to 50 (or in occasional cases to 75 or 100) by treating with auxin. As will be shown in section 2, the optimum concentration of indole-acetic acid for 24-hour treatment of such young pines is usually 200 mg. per liter.

Plate 228, figure 1 shows the appearance of some of the cuttings. The roots are thick, few in number and grow laterally. All groups showed very high percentage of survival and gave excellent growth. In one case a short shoot, i.e. single fascicle of needles, from a 3-year old tree formed roots and started to develop a terminal bud.

This effect of age is evidently widespread. It is shown markedly by spruce, maple and oak and also probably by ash. Table 2 summarizes experiments with one species of each of these and Plate 228, figure 2

*No numerical data are given in his publication.

shows a sample of the *Picea Abies* cuttings. It is notable that with the 6-months old maples auxin actually reduced the rooting, probably because the concentration (100 mg. per liter) was too high for such young material (cf. the youngest pines in table 1). A number of other experiments with maple have been lost through infection. On the whole the maples so far studied have shown little increase in rooting from auxin treatment. In all the species shown in table 2, as well as with *Aesculus* and *Ginkgo,* with which a few trials have been made, rooting is far more prevalent when cuttings are taken from young than from old trees.

2. Optimal auxin treatment

In order to minimize variables, all cuttings have been treated at the base with aqueous solutions of auxin for 24 hours at room temperature. Sufficient leaf surface was always present to allow of reasonable transpiration. Where leaves were to be cut back this was never done before the auxin treatment. For each plant a series of concentrations was tested, using this one exposure time and treating all cuttings the same way. Controls were placed in water for the same period.

As mentioned above, some conifers were found to root readily even on cuttings taken from old trees (70 years or more). Results from six such species are given in table 3. The most striking result is the readiness of rooting of hemlock (*Tsuga canadensis*) on treatment with auxin, when untreated cuttings in no case formed a single root (see Plate 229, figure 1). Hemlock, at least when cuttings are taken in the fall, is thus a good example of a plant adequately supplied with all factors for rooting except auxin.

The extreme slowness of rooting on the whole, especially in the yews, is also remarkable. In both yew species, however, roots appeared earlier on auxin-treated cuttings than on the controls.

It is impossible to make any general deduction about optimal auxin concentration. Each species apparently has its own optimum. In many, auxin 400 mg. per liter is highly toxic and results in killing of the tissue from the base up to the level reached by the solution. While this may lead to decreased rooting it does not always do so. Thus the *Taxus baccata* cuttings in table 3 were killed up to 2 cm. or so above the base, but they nevertheless rooted vigorously above the killed zone. Good rooting above the killed zone is also shown by other species, notably *Tsuga* (Plate 229, figure 2) and *Picea* (Plate 229, figure 3). This fact may be of theoretical importance (see discussion). Another difficulty arises from the fact that the concentration actually optimum for root-formation may not be optimal in practice, because cuttings exposed to

the higher concentrations frequently show extreme inhibition of the buds. Thus although the blue spruce (*P. pungens*) rooted freely in auxin, bud development was practically prevented for some months in all but a few specimens. In *Populus,* also very marked bud inhibition was shown on cuttings treated with 100 mg. per liter.

The variability of the "optimum" is further shown in respect to root number. As is well known, cuttings of aspen (*Populus tremuloides*) and Lombardy poplar (*P. nigra* var. *italica*) root readily. Plate 230, figure 1 shows the numbers of roots produced in 3 weeks. All cuttings, including water controls, produced one or more roots in this time. The reduction in root number at high concentrations is of course due to killing of the basal tissue, which was preceded by much swelling and splitting of the bark caused by vigorous cell enlargement in the cortex. The interesting point of Plate 230, figure 1 is that while *P. nigra* var. *italica* shows a reduction in root number at 100 mg. per liter, *P. tremuloides* shows a very large increase at this concentration. Both sets of cuttings were of the same age, taken at about the same time of year, and treated identically.

The corresponding data for young trees of some of the more difficult species are shown in table 4. Points worth noting are: — (a) the high percentage rooting of the young spruces treated with relatively weak auxin; (b) the high percentage reached by the young oaks in 400 mg. per liter; these were basal parts of the trees, the wood being 2 to 3 years old, and showed little or no killing by this high concentration (see section 3); (c) the failure of maple cuttings to respond notably to auxin treatment; (d) the rather extensive rooting of the white pines, 3 years old.

These data confirm and extend those of table 1; the second set of 3-year pines in table 1 is in fact the mean of the separated figures for lateral and terminal shoots in table 4. The others listed are from separate large experiments. The overall percentage rooting in these large groups does not much exceed 50%, but in individual smaller groups it is often greater (see table 6).

Again these data do not allow of any statement as to the optimal auxin concentration. Taking all of our experiments on white pine together, however, the optimum is 200 mg. per liter. The statement of Went and Thimann (1937) that "the highest non-toxic concentration of indoleacetic acid, dissolved in water, will give the best results" remains as near the truth as any.

Other methods of applying auxin, as in lanoline paste or in fine dust with talc, are also under test on cuttings of these types and may be reported on later.

It has recently been reported by Cooper and Went (1938) that a second auxin treatment some time after the first may give good results. Our own experiments on such "retreatment" are not very numerous. In one experiement 3-year old white pine (taken in March) treated 24 hours with 100 mg. per liter auxin gave only 4% rooting; when the treatment was repeated 3 days later the final rooting was 9%. On another occasion the same concentration produced 15% rooting on 3-year old and 15% rooting on 4-year old white pine; when retreated 3 days later the final values were 25% and 18% respectively. Thus in each case there was a small increase in the percentage rooting. The time for rooting was about 10 weeks in each case. Continually repeated treatments, though inconvenient in practice, might perhaps be more effective.

From time to time statements have been made that indole-butyric or α-naphthalene-acetic acids are more effective for root-formation than indole-acetic. Such comparisons as we have made do not bear this out. The differences are not large and are usually in favor of indole-acetic acid. *Syringa vulgaris* (var. "de Louvain,") taken in April, treated with 50 mg. per liter of each auxin, gave after 5 weeks 14% rooting with indole-acetic, 3% with α-naphthalene-acetic and 0% and 8% in two experiments with indole-butyric. Similarly Concord grapes (cuttings of one-year wood taken in May) gave 87% in indole-acetic and 73% in indole-butyric acid; the average number of roots formed was 11.1 with indole-acetic and 7.6 with indole-butyric acid. The water controls gave 60% rooting with an average root number of 1.4. It is possible that the contrary statements reported elsewhere are due to the use of impure samples of the substances.

Another statement occasionally made is that the salts of the auxins are more effective than the free acids. In so far as growth promotion is concerned this has been disproved by D. Bonner (1937) and Thimann and Schneider (1938). However, the data of the latter authors showed that, at very high concentrations, the toxicity or damage effect was reduced by neutralizing the acids to form salts. Since such high concentrations are just those used in propagation, a comparison was made between the free acid and the salt with indole-acetic, using cuttings from 3-year old white pine (table 5). Each figure in the table is based on 50 to 70 cuttings. The differences are insignificant.

3. The relative rooting ability of different parts of the plant

As shown in table 4, the lateral branches of *Pinus* consistently root better than the terminal shoots. The mortality among the lateral cut-

tings is also less. Table 6 shows in more detail the percentage rooting in water and in optimal auxin (either 100 or 200 mg. per liter indoleacetic acid) for 5 groups of lateral and terminal cuttings. Each figure is the average of 20 to 60 cuttings. In all groups but one the laterals give the higher rooting percentage in water controls, and in all 5 groups the higher percentage in auxin, 100% being reached in one case. The mortality among water controls is also significant. After a month 32% of all terminals treated with water had died, but only 3% of all laterals. Other experiments gave comparable results. One group of pine cuttings, taken in July, which rooted very poorly, gave only 0.4% rooting in terminals, as compared with 7.9% in laterals. Norway spruce (also included in table 6) shows the same phenomenon. The average behavior of a still larger number of cuttings from 3-year old white pines and Norway spruces is summarised in Plate 230, figure 2.

In view of the occasional records of rooting by layering of lateral branches under natural conditions it is possible that the ability of laterals to form roots (of course only to a very small extent, and not in *Pinus* itself) persists up to a considerable age.

It is interesting to note that the plagiotropic habit of growth is retained in lateral branches of *Picea* after they have rooted. As Plate 230, figure 3 shows, the new growth which develops after rooting is always at an angle to the vertical, while that of terminal shoots is erect. Of a total of 53 rooted laterals which were potted for observation, every one grew at an angle in this way, while all of the 18 rooted terminals which were potted grew vertically. This appears to be in conflict with observations such as those of Errera (1905) that when *Picea Abies* is decapitated one of the laterals grows vertically, for in that case the influence of the tip would only have to cease in order for the lateral growth to be changed. Our observations show that whatever influence has caused the plagiotropism of these laterals is by no means lost when they are isolated from the tree. It may, of course, be that in subsequent years these cuttings (which have been planted out) will change their habit. In *Pinus* this phenomenon is not shown, and rooted laterals seem to grow just as vertically as the terminals (Plate 231, figure 1).

Another difference in the rooting of different parts was found with oak and maple. Here, in young trees, the lateral shoots are short and not very vigorous. The apical part of the plant, comprising the last year's growth, roots rather poorly, and its rooting is not promoted appreciably by auxin treatment. The basal part, on the other hand, roots well and responds strongly to auxin. As table 7 shows, the bases of *Quercus borealis* can withstand 400 mg. auxin per liter and give very high per-

centage rooting therein; even in water controls there is moderate rooting. Some of the rooted cuttings are shown in Plate 231, figure 2. The data for *Acer* show the same effect. Here the numbers in each auxin group were too small for significant results, so that only the combined results are given. The reason for this behavior is not yet known (see discussion), but its practical importance for propagation when young trees are used is evident. The difference between apex and base has not yet been studied in conifers.

4. Medium and temperature conditions

A few comparisons of different rooting media are shown in table 8. On the whole either peat or the 2:1 mixture of sand and peat give slightly higher percentages of rooting than sand alone. On account of its high water content pure peat is apt to become very cold, and unless bottom heat is used this is a drawback. There was also (in *Pinus*) a higher percentage of rotting when the rooted cuttings were left in the peat than in the other two media. Since the differences are in no case large the mixture was mainly used.

The use of bottom heat for *Pinus* cuttings is definitely undesirable. Rooting was slower and of lower percentage in heated than in unheated boxes. The unheated boxes had a mean winter temperature close to 18°, the heated were maintained at 24°. In both cases somewhat higher temperatures (up to 27°) were reached in summer, even though the boxes were kept covered with cloth. Comparisons were not made on cuttings other than pine, since in many cases a temperature around 24° is known to be advantageous.

Treating the cuttings with permanganate (cf. Curtis, 1918) is also undesirable where auxin is to be applied basally. In our experiments the bases of the cuttings after placing in 0.1% $KMnO_4$ were thoroughly rinsed, but the data indicate that traces may have remained sufficient to inactivate part of the auxin afterwards applied. Indole-acetic and butyric acids are very sensitive to oxidation. The results for the two conifers in table 9 show only a reduction in rooting by permanganate treatment. In other experiments white pine also showed a small reduction. With poplar the effect of the treatment on the number of roots was studied, but though there was a slight increase in root number on the controls, the response to the auxin was decreased (table 9). It is notable, however, that those exposed to the highest auxin concentration were partially protected from killing by the permanganate. This may be due to partial auxin inactivation or perhaps to plugging of the vessels by the precipitate of manganese hydroxide and hence reduction in the

amount of auxin taken up. When auxin is applied at the apex, as in the standard pea-rooting test (Went, 1934; Thimann and Went, 1934) or with lanoline (Laibach, 1933, Laibach and Fischnich, 1935), permanganate inactivation of auxin probably does not occur because the auxin is already within the cells when it reaches the base.

Another frequently used procedure for pines and other resinous plants is to soak the bases of the cuttings in hot water to remove the resin. In a series of comparisons in which cuttings from 3-year old white pine were immersed in hot water at from 40° to as high as 90° for times between 2 minutes and 2 hours no beneficial effect was observed. The percentage was never above, and sometimes below, that of cold water-treated controls. Thus in one set of experiments the mean of all auxin concentrations for hot water treated cuttings was 14%, that of cold water-treated controls 17%. In another set the values were 15% and 24% respectively. In view of the fact that resin was certainly exuded from the bases of the cuttings, there seems no reason to believe that this in itself has any inhibitory effect on rooting. Usually the resin came away readily enough on wiping or on placing in the propagating boxes. Hot water treatment has not been tested on other conifers.

5. Substances other than auxin

The action of auxin is to cause the initiation of roots. The root initials thus formed must then grow out, and this growth requires nutritive materials. Probably carbohydrate is the most important single factor for such growth. In experiments with etiolated plants, rooting is definitely dependent on the supply of sugar (Bouillenne and Went, 1933; see Went and Thimann, page 194, figure 62). Plants in the light, with leaves, might be expected to have an adequate carbohydrate supply, but our experiments show that this is not necessarily true. Table 10 gives representative data from ash and white pine cuttings, which were immersed in the auxin solution (or in water) for 24 hours as usual and then placed in 5% sucrose for 3 days, rinsed and transferred to the propagating boxes. All figures except the last pair represent percentage rooting. The last pair of figures shows that the mortality among the cuttings is reduced by sugar treatment. This effect became marked early in the experiment, most of the non-sugar cuttings which had not rooted dying off within 6 weeks, while in the sugar-treated cuttings a large proportion of the unrooted cuttings still lived. When it is remembered that one of the major problems of propagation is maintenance of the unrooted cuttings, the value of such sugar treatment is clear. The increase in percentage rooting may be due, at least in part,

to this action of sugar on maintenance. The young ash cuttings in table 10 gave poor rooting and the data are not significant.

Another substance known to be essential for growth of roots is vitamin B_1 or aneurin. Went, Bonner and Warner (1938) have increased the rooting of camellias and other plants considerably by treatment with this substance. The effect is presumably not exerted on root initiation itself but only on subsequent growth of the roots. Our own experiments on vitamin B_1, while not very numerous, have not shown very marked effects. When it was first found that cuttings from old pines did not root after treatment with auxin, the action of vitamin B_1 was tested. Of a large group of cuttings taken in September from a tree 65 years old, a number were treated for 24 hours with 1 mg. per liter of vitamin B_1 following auxin treatment, but none rooted. In another group the cuttings were given the same concentration of vitamin B_1 two months after auxin treatment, and also given sugar. One of the cuttings later rooted. With *Fraxinus*, a group of cuttings which had not rooted one month after auxin treatment were given the vitamin, and 7 weeks later 10% had rooted, while the control group not given the vitamin but having received the same auxin treatment gave no rooting. Another group of *Fraxinus* which were given sugar as well as auxin gave 2% rooting when receiving no vitamin and 5% when given 1 mg. per liter for 24 hours one month after the auxin treatment.

The results are thus favorable to the vitamin treatment, though the effects are small, and it may be deduced that, as with carbohydrate, the amount of vitamin B_1 present or synthesized in the cutting is probably not optimal. However, it is also evident that neither the vitamin nor carbohydrate is the factor which is missing from old trees.

A few experiments have also been made with a biotin preparation (from egg yolk), biotin being also known to be of importance in rooting (see Went and Thimann, page 196). The data are insufficient for report here, but it is of interest that one cutting from old pines rooted when the auxin treatment was followed by biotin.

More systematic trials with these substances are of course in progress.

DISCUSSION

Without doubt the main fact of importance which the experiments have shown is that the tendency to form roots is controlled not by the age of the cutting, but by the age of the tree from which the cutting is taken. This is, of course, in some ways an old observation, since as long ago as 1913 Goebel pointed out that cypress cuttings taken from juvenile plants root more readily than those from mature trees. The

literature contains several scattered reports of the same type, and one very important systematic study by Gardner (1929). Of 21 trees studied, including seven conifers, all but two species showed very much better rooting when cuttings were taken from one-year seedlings than from old trees. Where two- and three-year old trees were studied the percentage rooting decreased with increasing age. The recent study of Stoutemyer (1937) confirms the findings of Gardner in that the tops of one-year apple seedlings seldom failed to root. Stoutemyer further shows that ease of rooting in these young plants is associated with juvenility of leaf form. Thus adventitious shoots from the root had juvenile foliage and rooted readily, while normal twigs or adventitious shoots from the trunk had adult foliage and failed to root. Auxin treatments were not studied.

From a practical point of view, as Gardner points out, it is of little use to make cuttings from one-year old plants since almost the whole plant is used. By taking advantage of the fact that up to 3 or 4 years old the ability to root is still present if auxin is supplied, our experiments show that white pine and many other "difficult" plants can be readily rooted and may be propagated vegetatively in a practical way. No doubt the responsive period can be extended another year or two and this will be further studied. In view of the representative nature of the trees we have used, including both gymnosperms and angiosperms, the above is doubtless a general principle, and for selection work it might be said that the problem of the rooting of "difficult" plants is partially solved.

The explanation of this ease of rooting is, however, by no means easy, and the theoretical problems are not solved but actually increased. It is difficult to associate the ease of rooting (as did Stoutemyer with *Malus*) with a stage of "juvenility," for two reasons; — firstly because many of the trees used do not show any definite juvenile characters, either of leaf or growth habit, at the age of 3–4 years,* and secondly because the effect is evidently quantitative rather than qualitative, the ease of rooting falling off steadily with increasing age. On the contrary, it is evident that there is a ***physiological juvenility***, which is quantitative in character, and which controls the ease of rooting in presence of sufficient auxin. This physiological juvenility may or may not produce qualitative morphological differences, according to the species.

Further, along with the age effect must also be considered the differences within the plant, lateral shoots rooting better than terminal, and

*But note the difference between the foliage of 3-year old and 65-year old *Pinus Strobus* in Plate 231, figure 1..

basal pieces better than apical. In all these cases, not only is the rooting better in water controls but the increase due to auxin is also greater (see Plate 230, figure 2). Hence the differences cannot be due to differences in auxin content of the cuttings. The experiments with substances other than auxin, while admittedly very scanty, show clearly that these are not the main factors which are missing from old trees or from poorly-rooting cuttings in general. Some *internal factor* of an unknown kind is evidently concerned. It would be easy to postulate a special substance, whose formation decreases with age, and whose distribution within the plant is responsible for the differences in rooting of the different parts such as the "rhizocaline" postulated by Went (1934, 1938) and Cooper (1938). In this connection it is important to note that in *Taxus, Pinus, Tsuga* and *Picea,* very high auxin concentrations, sufficient to kill the base of the cutting, by no means prevent root formation, but roots are formed in good numbers above the killed zone. According to the theory of Went (see especially Cooper, 1938) the auxin should draw the "rhizocaline" down to the base of the cutting, and if the base is then cut off or allowed to rot away all the rhizocaline would be lost along with it. Our experiments, therefore, while by no means conclusive, do not support this view of auxin action. The data of Pearse (1938) on *Salix* also do not agree with those of Cooper on *Citrus*. Apart from the "rhizocaline" theory, however, it remains very probable that the *internal factor* is a special substance or group of substances.

It is, however, also possible that the differences in rooting ability between old and young, or between terminal, lateral and basal parts, are morphological in nature. Specifically, they might be due to the absence in the poorly-rooting cuttings of certain types of cell which are those responsible for root initiation. In view of the recent finding of Dorn (1938) that roots are apparently initiated in different cell layers in different plants this does not seem very probable but must still be considered. An anatomical study of rooted cuttings taken from a series of ages would throw light on this problem. As yet the evidence does not allow of any decision between these two possibilities.

SUMMARY

1. A study has been made of the vegetative propagation of a number of coniferous and deciduous trees which are known to form roots from cuttings only with extreme difficulty.

2. The most important single factor in rooting these "difficult" trees is the age of the tree from which cuttings are taken. The ease with which roots are formed (on cuttings of one-year wood) falls off steadily with

increasing age of the tree. This applies both in the presence and in the absence of auxin treatment.

3. When cuttings are taken from trees 3 to 4 years old, and treated with the optimal concentration of indole-acetic acid or other auxin, excellent rooting is obtained with white pine (*Pinus Strobus*), Norway spruce (*Picea Abies*), red oak (*Quercus borealis*), Norway maple (*Acer platanoides*) and to a less extent with American ash (*Fraxinus americana*).

4. The optimum concentration of auxin depends upon the material. Using aqueous solutions applied to the base for 24 hours, it varies between 25 and 400 mg. per liter.

5. In *Pinus* and *Picea,* lateral shoots root more readily than terminal, and in *Quercus* and *Acer,* the bases of the young plants root more readily than the apices.

6. Rooted lateral branches of *Picea Abies* retain their plagiotropic habit of growth for at least one year, while those of *Pinus* apparently do not.

7. Exposure of the bases of the cuttings to permanganate or hot water before auxin treatment did not promote rooting in any of the species.

8. Application to the Pinus cuttings of sugar solution, following treatment with auxin, increased the percentage rooting and decreased the mortality rate.

9. A second treatment with auxin some days after the first, or a treatment with vitamin B_1, may have a small beneficial effect.

10. In some conifers, notably *Tsuga canadensis* and *Picea pungens,* cuttings from old trees root exceedingly well if treated with auxin but not at all in absence of auxin.

11. Basal treatment with high auxin concentrations frequently inhibits development of the buds on cuttings, sometimes for several weeks. In other cases it may cause killing of the base, but this does not necessarily interfere with good root formation.

12. Root formation in presence of optimal auxin is apparently controlled by an internal factor whose amount and distribution varies with the location of the cutting on the tree and with the age of the tree.

TABLE 1.

EFFECT OF AGE OF THE TREE ON THE ROOTING OF WHITE PINE CUTTINGS.

Age of tree in years	Percentage of cuttings rooting in auxin of concentration:				Approximate time for rooting in weeks.
	0	100	200	400 mg. per liter	
½ to 1	31	20	—	—	6
2	18	46	—	—	7
3	1	10	31	50	11
3	18	36	37	27	8
(another experiment)					
10	0	0	—	—	
65	0	0	0*	0*	15 to 21

* Occasional rooting but less than 1%.

TABLE 2.

EFFECT OF AGE OF THE TREE ON THE ROOTING OF SPRUCE, MAPLE, ASH AND OAK CUTTINGS.

All data the mean percentage rooted, terminal and lateral cuttings being combined. Auxin concentration 100–200 mg. per liter.

Species	Age of tree from which cuttings were taken (years).							
	½		2		3 and 4		60 or over	
	Water	Auxin	Water	Auxin	Water	Auxin	Water	Auxin
Picea Abies	—	—	—	—	35	78	0	0
Acer platanoides	67	7	40	60	31*	30*	—†	—†
Fraxinus americana	—	—	—	—	0	7	0	1
Quercus borealis	—	—	—	—	9.5	18	0	0

* Combined data from 3, 4 and 5 years.
† Occasional rooting but less than 1%.

TABLE 3.

EFFECT OF AUXIN TREATMENT ON THE ROOTING OF CUTTINGS FROM OLD TREES OF VARIOUS CONIFERS.

All data the mean percentage rooted, terminal and lateral cuttings being combined.

Species	Month in which the cuttings were taken.	Auxin concentration in mg. per liter.					Approximate time for rooting in weeks.
		0	50	100	200	400	
Taxus baccata repandens	October	40	—	95	—	100	24
Taxus cuspidata	June	0	—	—	29	—	10
Tsuga canadensis	October	0	—	8	—	79	10
Tsuga canadensis	October	0	—	50	—	100	21
Tsuga canadensis pendula	December	0	63	54	—	—	8 to 11
Picea pungens Moerheimii	April	0	—	80	60	14	8
Keteleeria Davidiana	December	0	—	100	—	—	7

TABLE 4.

EFFECT OF AUXIN TREATMENT ON THE ROOTING OF CUTTINGS FROM YOUNG TREES.

All data the mean percentage rooted.

Species and age	Month in which the cuttings were taken.	Auxin concentration in mg. per liter.				
		0	25	100	200	400
Pinus Strobus 3 years	October	38	—	30	—	55
Pinus Strobus 3 years	February	7	—	20	29	23
Pinus Strobus 3 years	March					
(laterals only)		27	—	48	51	33
(terminals only)		9	—	24	23	20
Picea Abies 3 years	April	35	72	78	—	78
Fraxinus americana 4 years	March	0	—	7	5	0
" " " "	"	0	—	25	—	—
Acer platanoides 2 to 5 years	June	33	—	44	32	14
Quercus borealis 4 years (basal parts only)	February	22	—	30	38	82

TABLE 5.

EFFECT OF NEUTRALIZATION OF INDOLE-ACETIC ACID SOLUTION.

Pinus Strobus, 3 years old; lateral and terminal combined. Cuttings taken in February. All data the mean percentage rooted in 10 weeks.

	Auxin concentration in mg. per liter.			
	0	100	200	400
Free acid	5	20	10	12
Potassium salt	5	12	18	10

TABLE 6.

COMPARATIVE PERCENTAGE ROOTING OF TERMINAL AND LATERAL SHOOTS.

Percentage rooting in 11 weeks.

Treated with water		Treated with auxin	
Terminal	Lateral	Terminal	Lateral
Pinus Strobus, 3 years old; taken in February			
7	25	28	43
3	30	15	68
19	25	70	77
23	47	33	100
11	9	20	34
Picea Abies, 3 years old; taken in April			
20	41	56*	87*

* Mean of 25, 100 and 400 mg. per liter auxin.

TABLE 7.

COMPARATIVE PERCENTAGE ROOTING OF DIFFERENT PARTS OF THE PLANT.

	Auxin concentration in mg. per liter.				Mean of all treated with auxin.
	0	100	200	400	
Quercus borealis, 4 years old; taken in February					
Terminal shoots	8	3	9	2	5
Lateral shoots	0	0	8	0	3
Basal parts (cf. table 4)	22	30	38	82	55
Acer platanoides, 4 and 5 years old; taken in June					
Terminal shoots	0	—	—	—	18
Basal parts	—	—	—	—	50

TABLE 8.

PERCENTAGE ROOTING IN THREE MEDIA.

Material	Treatment	Peat	Peat and Sand	Sand
Pinus Strobus laterals	Auxin 100 to 400 mg. per liter	36	50	34
Taxus baccata all parts	Auxin 100 mg. per liter	87	—	73
Quercus borealis all parts	Mean of all	—	12	9
Quercus borealis basal parts	Auxin 100 mg. per liter	—	30	22

TABLE 9.

EFFECT OF THE BASAL APPLICATION OF PERMANGANATE PREVIOUS TO AUXIN TREATMENT.

Species and month	Pretreatment	Auxin concentration in mg. per liter.			
		0	25	100	400
Tsuga canadensis					
September	Water	0	—	50	100
(*% rooting*)	$KMnO_4$	0	—	0	75
Picea Abies					
October	Water	63	78	78	89
(*% rooting*)	$KMnO_4$	22	67	55	67
Populus tremuloides					
October	Water	4	18	39	0*
(*No. of roots per cutting*)	$KMnO_4$	8	13	25	9

* Killed.

TABLE 10.

EFFECT OF SUGAR TREATMENT ON PERCENTAGE ROOTING AND ON SURVIVAL.

Material	First treated for 24 hours with:	Afterwards treated for 3 days with:	
		SUGAR	WATER
Fraxinus americana 70 years	Auxin 100 to 200 mg. per liter	11	0
Fraxinus americana 4 years	Auxin 100 to 200 mg. per liter	2	3
Pinus Strobus 3 to 4 years	Water	14	8
" "	Auxin 100 mg. per liter	17	5
" "	Auxin 100 mg. per liter retreated	22	6
Pinus Strobus	All auxin treatments Percentage still living after 10 weeks	36	15

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DESCRIPTION OF PLATES

PLATE 228

Fig. 1. *Pinus Strobus.* From 3-year old trees. Left to right, 400, 100, 0 mg. auxin per liter. After 10 weeks.
Fig. 2. *Picea Abies.* From 3 year old trees. Left to right, 400, 100, 25, 0 mg. auxin per liter. After 7 weeks.

PLATE 229

Fig. 1. *Tsuga canadensis.* From tree about 40 years old. Left to right, 400, 100, 0 mg. auxin per liter.
Fig. 2. *Tsuga canadensis* var. *pendula.* From tree about 50 years old. Left to right, 100, 50, 0 mg. auxin per liter.
Fig. 3. *Picea pungens.* From tree about 60 years old. Left to right, 400, 200, 100, 0 mg. auxin per liter.
All three after 9–10 weeks.

PLATE 230

Fig. 1. Average number of roots per cutting formed in 3 weeks on two species of *Populus* treated with water and auxin.
Fig. 2. Comparison of the percentage rooting of lateral and terminal shoots from 3-year old trees of *Pinus Strobus* and *Picea Abies.* The white columns represent the percentage rooting of the water controls, the black columns the additional percentage rooting resulting from optimal auxin treatment.
Fig. 3. *Picea Abies.* From 3-year old trees. Left, lateral; right, terminal. Photographed 3 months after rooting, during which the new growth above the arrow has taken place.

PLATE 231

Fig. 1. *Pinus Strobus.* Left to right, two laterals from 3-year old trees, two terminals from 3-year old trees, lateral from 65 year old tree. Photographed 6 months after rooting. Note vertical growth of laterals, also the difference in foliage between 3-year and 65-year trees.
Fig. 2. *Quercus borealis.* Basal cuttings from 4-year old trees. Left to right, 400, 200, 100, 0 mg. auxin per liter.

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FIG. 1

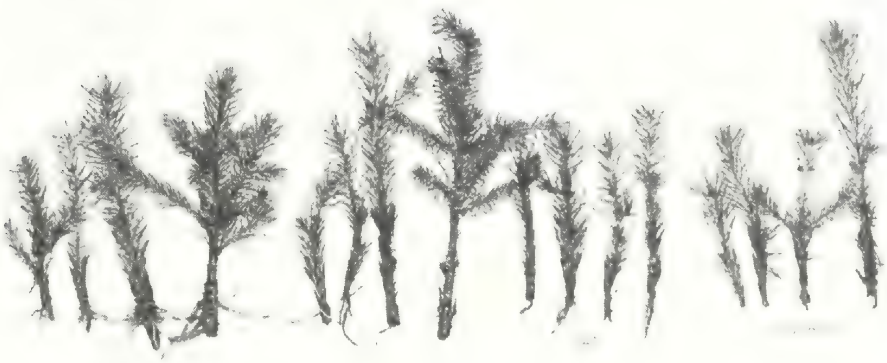

FIG. 2

THE VEGETATIVE PROPAGATION OF DIFFICULT PLANTS

FIG. 1

FIG. 2

FIG. 3

THE VEGETATIVE PROPAGATION OF DIFFICULT PLANTS

FULL-TONE — MERIDEN

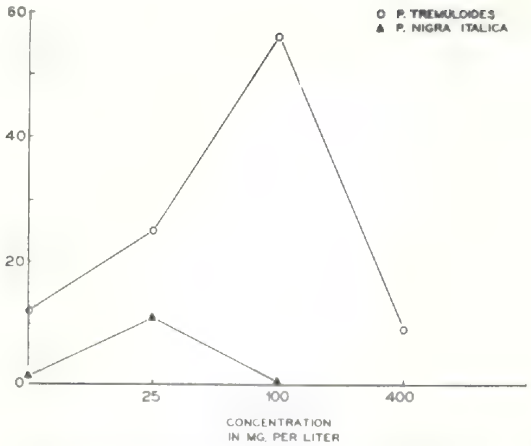

FIG. 1

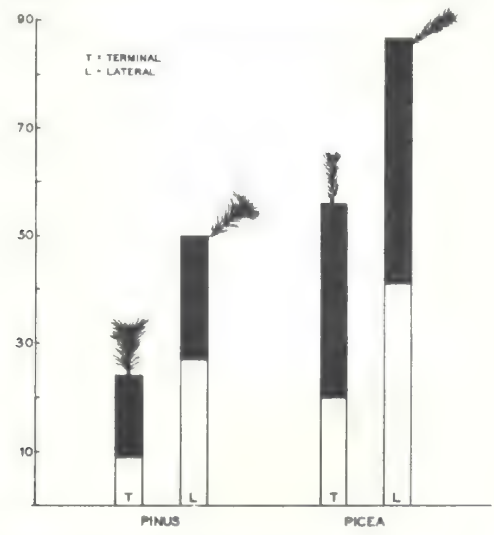

FIG. 2

THE VEGETATIVE PROPAGATION OF DIFFICULT PLANTS

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BIBLIOGRAPHICAL NOTE ON "EHRH. PLANTAG."

Alfred Rehder

Ehrhart in his paper "Bestimmung einiger Bäume and Sträuche" published in his Beiträge zur Naturkunde, **6**: 85–103 (1791) mentions in the synonymy a number of new names with the citation "Ehrh. plantag." So far no one seems to have found out to which publication this citation refers; if cited at all, it is cited as Ehrh. plantag. ex Ehrh. Beitr., as it is in Index kewensis. After a diligent search in contemporaneous literature, I came to the conclusion that Ehrhart's citation could not refer to any other publication than an anonymous list of trees and shrubs issued in 1787 under the title: Verzeichniss der Bäume und Sträuche welche sich auf der Königl. Plantage zu Herrenhausen bei Hannover befinden. 0.30 pp. [Hannover ?] 1787.

Since I was unable to locate this work in any American library, I wrote to Dr. L. Diels, Director of the Berlin Botanical Garden and Museum, who found it in the Staatsbibliothek in Berlin and kindly sent me a photostatic copy of it.

As Ehrhart cites it in his Beiträge as his own publication with the rather mystifying abbreviation "plantag." evidently taken from the word "Plantage" in the title, and as the numerous new names have their author cited as "E.," it is evident that Ehrhart is to be considered the author of this phamphlet.

The publication consists of a bare list of names with their authors, but without any descriptions, synonyms or notes. The new names and combinations bear only the author citation "E." and are all nomina nuda; there are about 210 such names. The names cited in Beiträge are found on the page indicated, and besides these, there are many more, particularly garden forms under *Amygdalus, Prunus* and *Pyrus,* all with the author citation "E." Since in the new combinations neither the synonym nor the original author is given they must technically be considered nomina nuda, even if there can be no doubt of the species which the combination represents, as in *Pyrus aucuparia* E. or *P. arbutifolia nigra* E.

Arnold Arboretum,
Harvard University.

NOTE

VII. INTERNATIONAL BOTANICAL CONGRESS STOCKHOLM, 1940

MOTIONS dealing with Nomenclature for consideration by the Seventh International Botanical Congress, Stockholm, 1940, should be sent before July 1, 1939, to the Rapporteur général, Dr. T. A. Sprague, The Herbarium, Royal Botanic Gardens, Kew, Surrey, England.

Motions must be presented in the form of additional articles or amendments to the International Rules. They should be drafted as briefly as possible. At least 100 printed copies must be presented.

SECTION FOR TAXONOMY AND NOMENCLATURE

RECORDER:
Dr. J. A. Nannfeldt

JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XX APRIL, 1939 NUMBER 2

ON THE BRASS COLLECTIONS OF PANDANACEAE FROM NEW GUINEA*

E. D. MERRILL AND L. M. PERRY

With two plates

THIS PAPER consists essentially of a consideration of the Pandanaceae collected by Mr. L. J. Brass on the first and second Archbold Expeditions to New Guinea. As the Papuasian region is botanically not well known, in the process of determining these collections, it appeared desirable to us to include a consideration of our other unnamed Pandanaceae from New Guinea. Further, since it was necessary to survey the literature of the group, it seemed expedient at the same time to name the several collections of Mr. Brass and Mr. S. F. Kajewski from the Solomon Islands. The material examined contains forty presumably new species and new localities for thirty-eight previously described ones.

The literature is somewhat scattered and that on the Solomon Islands is very scanty. Only seven species of *Pandanus* and two of *Freycinetia* have hitherto been reported from these islands. Here, descriptions of fourteen more new species are added, five of *Pandanus* and nine of *Freycinetia*.

In 1900 Warburg, Pflanzenr. **3(IV.9)**: 1–87, recorded eleven species of *Pandanus* and eight of *Freycinetia* from New Guinea. Twenty-eight years later Martelli, Pandanaceae Novae Guineae, Considerationes, Nuov. Giorn. Bot. Ital. II. **34**: 1166–1170, called attention to the rapid increase in the number of known species from this region pointing out that there were then recorded from New Guinea alone thirty-four species of *Pandanus* and fifty-four of *Freycinetia*. Although Papuan representatives of all these species may have been known to Martelli, of the

*Results of the Richard Archbold Expeditions.

latter genus we have found actually published records for only thirty-four species, and are therefore inclined to believe that Martelli intended to indicate the latter figure, fifty-four probably being a typographical error. In the material we have examined, we have segregated twenty-five apparently new species, ten belonging to *Pandanus*, the rest to *Freycinetia*. Martelli's illustrations (Webbia 4) have been most helpful in the determination of the *Pandanus* species, the new ones falling readily into the sections maintained both by Warburg and by him. A key is greatly to be desired for such an unwieldy group, but this would be practically worthless without access to the types of species already established. The species of *Freycinetia* are very difficult to determine. The variation in the size of the leaves, the caducous or early deciduous auricles, the varying number of stigmas, the frequent immaturity of the syncarps in the material available, and the often more or less distorted dried berries are all inconvenient factors to be considered. The seeds show much variation in the size of the raphe and in the development of the strophiole, but these are usable characters only when mature or nearly mature fruits are available.

The term *auricle* is used somewhat loosely throughout this article to indicate the membranaceous (or submembranaceous) margin of the amplexicaul or sheathing base of the leaf. This margin may be auriculate at the distal end, or diverse in outline (rounded, truncate, or acuminate) and adnate.

The arrangement of the sections follows that of Warburg. All types, unless otherwise stated, are in the herbarium of the Arnold Arboretum.

Freycinetia Gaudichaud

Section Oligostigma

Freycinetia inermis Ridley, Trans. Linn. Soc. II. Bot. 9: 236. 1916.

British New Guinea: Palmer River, 2 miles below Black River Junction, *Brass 6925, 6928, 7156, 7177,* June, July, 1936, common in all types of forest; Fly River, 528 Mile Camp, *Brass 6719,* May, 1936, common in undergrowth layers of ridge-forests.

Closely allied and perhaps belonging here are the two following collections: Northeast New Guinea, Wabbe, *Schlechter 16471;* Solomon Islands, San Cristoval, Hinuahaoro, *Brass 2927,* September 22, 1932, on forest trees, at 900 m. alt., common (bracts white; fruit red). These differ from the original description chiefly in having the leaves denticulate at the apex.

Freycinetia stenophylla Warburg in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee Nachtr. 53. 1905; Martelli, Webbia **3:** 315. 1910, Jour. Arnold Arb. **10:** 137. 1929; White, op. cit. 201.

British New Guinea: Fly River, 528 Mile Camp, *Brass 6720,* May, 1936, in undergrowth and on substage trees in ridge-forests, at 80 m. alt., common (small climber; fruit-heads ± 1 cm. long); Palmer River, 2 miles below Black River Junction, *Brass 6929, 7124,* June, July, 1936, in undergrowth and lower substage levels of ridge-forests, at 100 m. alt., common (fruit-heads ± 1.7 cm. long, 1.4 cm. in diameter.)

Although we have not seen the type of this species, the specimens cited conform well with the original description. All the fruit-heads are immature.

Freycinetia polyclada sp. nov. § *Oligostigma.* Pl. I, f. 3.

Rami novelli copiose foliosi, ad nodos radicantes; foliis 7–8 cm. longis, 3–4 mm. latis, linearibus, acutis, apice basique serrulatis, caeterum laevibus; auriculis ± 2.5 cm. longis, 4 mm. latis, membranaceis, linearilanceolatis, obtusis, apice serrulatis, in fibras tandem solutis. Ramulis fructigeris brevibus, 10–12 cm. longis, ± 4 mm. diametro; foliis angustioribus, 7(–15) cm. longis, ± 2.5 mm. latis; auriculis vix 2 cm. longis; infructescentiis terminalibus, monocephalis; spathis foliis brevioribus latioribusque, ± 3 cm. longis, 6 mm. latis, lanceolatis, ± caducis; syncarpio late ellipsoideo vel subgloboso, 2.3 cm. longo, 1.7–2 cm. crasso, pedunculato; pedunculo 5 mm. longo, laevi; drupis 6 mm. longis, parte apicali 1.5 mm. longa, libera, ± truncato-pyramidata, angulosa, annulo angusto cincta; stigmatibus vulgo 2(–3), oppositis; seminibus 1 mm. longis, subincurvis, raphe strophioloque albis, crassiusculis.

British New Guinea: Central Division, Mount Tafa, *Brass 4961* (type), September 3, 1933, in sheltered valley-forest, at 2400 m. alt., very common (small root-climber; stems closely attached to the support-tree and ascending 10 m. or more; lateral branches appressed to the tree-trunk, very numerous; syncarps solitary; drupes orange-red); Central Division, Mafulu, *Brass 5300,* October 18, 1933, in oak forest, at 1250 m. alt., abundant (syncarps orange-yellow).

The leaves in *Brass 5300* are about twice as long as those of the type-number, but both certainly appear to belong to the same species. *Freycinetia polyclada* is most closely related to *F. stenophylla* Warburg. It differs in having branches with both leaves and short roots usually at all the nodes, numerous short branchlets, and leaves usually with conspicuous auricles and more minute denticulations at the base and the apex.

Freycinetia Beccarii Solms-Laubach, Ann. Jard. Bot. Buitenz. **3:** 100. 1883; F. Mueller, Notes Papuan Pl. **2:** 68. 1890; Warburg, Pflanzenr. **3(IV.9):** 30. 1900; Martelli, Webbia **3:** 309. 1910; Rendle in Gibbs, Contr. Phytog. Fl. Arfak Mts. 198. 1917; Martelli, Jour. Arnold Arb. **10:** 137. 1929; White, op. cit. 201.

NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, *Clemens 828,* November 8, 1935, at about 900 m. alt.

The immature material does not seem to differ specifically from *Brass 929* named by Martelli.

Freycinetia ellipsoidalis sp. nov. § *Oligostigma.*

Ramuli 3–4 cm. crassi; internodiis ± 1 cm. longis, scabridiusculis; foliis late patentibus, subcoriaceis, lanceolatis, 4.5–5.5 cm. longis, ± 1.5 cm. latis, apice acutis vel breviter acuminatis, saepe plicatis, basi paullo angustatis, subamplexicaulibus, margine et costa media inermibus, apice tantum minutissime denticulatis, subtus remotiuscule et longitudinaliter venoso-striatis; auriculis submembranaceis, in fibras cito solutis, deciduis, 0.5–1 cm. longis. Inflorescentiis terminalibus; syncarpiis 3, immaturis, oblongis, 2 cm. longis, ± 1 cm. crassis, pedunculatis; pedunculis 1.5 cm. longis, laevibus; baccis (immaturis) 4 mm. longis, prismaticis, apice libero (1.5–2 mm. longo) convexis vel depresso-pyramidatis; vertice plano; stigmatibus vulgo 1–2.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass 6924,* June, 1936, in forest substage, at 100 m. alt., common climber (fruit-heads immature, ± 10 mm. long, 6 mm. diameter), *Brass 7142* (TYPE), June, 1936, at 100 m. alt., climbing to 2–3 m. in forest undergrowth.

The species has the same general habit as *Freycinetia Beccarii* Solms-Laub., but the leaves are not so distinctly veined or dentate, the apices of the drupes are shorter and distinctly rounded or depressed, not so sharply angled or pyramidal, and the branchlets below the nodes are slightly granular.

Freycinetia nervosa sp. nov. § *Oligostigma.* Pl. I, f. 9.

Ramuli 1 cm. crassi; foliis dissitis, patulis, membranaceis, lanceolatis vel late oblongis, 9–11(–14) cm. longis, 3–3.5(–5) cm. latis, apice plicatis, attenuatis, abruptiuscule in acumen brevem (1 cm. longum) abeuntibus, basi sensim angustatis (6–8 mm. latis); nervis parallelis utrinque prominulis, transversalibus utrinque distinctis, margine fere laevibus, apice tantum serrato-denticulatis; auriculis in fibras cito solutis, caducis. Inflorescentiis terminalibus; pedunculo communi 0.5–1 cm. longo; syncarpiis vulgo 3, oblongo-ellipsoideis, in sicco 3 cm. longis, 2 cm.

crassis, pedunculatis; pedunculis vix 1.5 cm. longis, laevibus; baccis fere usque ad apicem carnosis, angulosis, 5 mm. longis, apice acute pyramidatis; stigmatibus 1–3; seminibus vix 1 mm. longis, raphe raphidophora, strophiolo subnullo vel nullo.

British New Guinea: Palmer River, 2 miles below Black River Junction, *Brass 6926* (type), June, 1936, climbing to a few meters in the forests of the lower ridges, at 100 m. alt. (fruit-heads brownish pink, the largest 3.5 cm. long, 2.5 cm. in diameter), *Brass 7081,* June, 1936, climbing to 2–3 m. in ridge-forests (fruit-heads brown, to ± 2 cm. long).

Although the texture and the venation of the leaves of *Freycinetia nervosa* are similar (at least as to description) to those of *F. streptopifolia* Warburg, we have hesitated to assign our collections to that species for two reasons: the leaves of *F. streptopifolia* are smaller than those of our material; and Martelli, Webbia **3:** 315. 1910, reduced the species to *F. Beccarii* Solms-Laub. The syncarps and the berries as well as the leaves of the latter are much smaller than those of *F. nervosa.*

Freycinetia elliptica sp. nov. § *Oligostigma.*

Ramuli ± 5 mm. crassi; foliis dissitis, patulis, membranaceis, ellipticis, 8–10 cm. longis, 4–4.5 cm. latis, apice plicatis, abrupte acuminatis, basi breviter angustatis, ± 7 mm. latis, nervis parallelis utrinque prominulis, transversalibus utrinque distinctis, apice tantum serratodenticulatis; auriculis 2.5 cm. longis, cito solutis, caducis. Inflorescentiis terminalibus; syncarpiis vulgo 3, oblongo-ellipsoideis, immaturis, ± 2 cm. longis, ± 1 cm. crassis, pedunculatis; pedunculis circiter 1.5 cm. longis, laevibus; baccis usque ad apicem succulentis, ± 4 mm. longis, angulosis, apice obtuse pyramidatis; stigmatibus 1–3; seminibus maturis vix 1 mm. longis, 0.5 mm. latis, raphe raphidophora, strophiolo nullo.

Northeastern New Guinea: Morobe District, Yunzaing, *Clemens 3810* (type), August 4, 1936, at about 1500 m. alt.; Ogeramnang, *Clemens 4602,* December 7, 1936, at about 2000 m. alt.

The species is very closely allied to *Freycinetia nervosa;* nevertheless, it is easily distinguished by the broader and shorter leaves, and the obtuse apex of the berries, those of *F. nervosa* having a short beak.

Freycinetia Forbesii Ridley, Jour. Bot. **24:** 359. 1886; Martelli, Webbia **3:** 310. 1910.

British New Guinea: Palmer River, 2 miles below Black River Junction, *Brass 7209,* July, 1936, at 100 m. alt., climbing to 10 m. in the ridge-forests (fruit-heads reddish brown, globose, ± 1.8 cm. in diameter).

Although this collection does not wholly agree with the original description, it conforms so well that we hesitate to consider it a new species without opportunity to compare it with the type. The fruit-heads are immature.

Freycinetia oblanceolata Martelli, Webbia **3**: 176, 313. 1910; Rendle in Gibbs, Contr. Phytog. Fl. Arfak Mts. 197. 1917.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass 7132*, in ridge-forests, at 100 m. alt., sporadic (a very distinctive species of loose branching habit, climbing to 3–4 m.; leaves smooth, concave towards the apex; young leaves pale underneath; unripe fruit-heads to 4.5 cm. long, 2.5 cm. in diameter; seeds pink).

The collection agrees with Martelli's description except that the stigmas are usually 2–3, the peduncles very slightly roughened along the angles, the strophiole very narrow or lacking, and usually a few raphides on either side of the raphe. These are probably differences of no great significance.

Freycinetia vulgaris sp. nov. § *Oligostigma*.

Ramuli ± 5 cm. crassi; internodiis ± 1 cm. longis; foliis dissitis, lineari-lanceolatis, chartaceis, 14–20 cm. longis, circiter 1.5 cm. latis, utrinque sensim attenuatis, ad basin 4–5 mm. latis, subamplexicaulibus, apice acuminatis, longitudinaliter venoso-striatis, margine fere laevibus, apice tantum minutissime denticulatis, costa media subtus versus apicem minutissime spinulosa; auriculis caducis (non vidimus). Inflorescentiis terminalibus; syncarpiis 3, oblongo-ellipticis, 1.5–2.5 cm. longis, 1–1.5 cm. latis, pedunculatis; pedunculis vix 2 cm. longis, laevibus; baccis usque ad apicem succulentis, 5 mm. longis, cylindricis (?), apice libero, brevi, convexiusculo, in summo vertice subplano; stigmatibus 2–3(–6), confluentibus, annulo levi cinctis; seminibus 1 mm. longis, raphe raphidophora, strophiolo nullo.

NORTHEASTERN NEW GUINEA: Ogeramnang, *Clemens 4705* (TYPE), December 22, 1936, in hill-forest, at ± 1750 m. alt.

At first glance this species appears to be conspecific with *Freycinetia Hollrungii* Warburg. A closer examination of *F. vulgaris*, however, shows the following differences: the fruit-heads are much more compact, the free apex of the berries is shorter, more convex and not so definitely angular, the stigmas are more obvious although the apex is not particularly pyramidal, and the seeds are smaller, the inconspicuous raphe being marked chiefly by a row of raphides on either side.

Schlechter 16412, Kelel, Northeastern New Guinea, may also belong to this species. Our specimen is very immature.

Freycinetia Brassii sp. nov. § *Oligostigma.*

Ramuli ± 5 mm. diametro; internodiis circiter 1 cm. longis; foliis (15–)20–30 cm. longis, 2 cm. latis, linearibus, acuminatis, versus basin paullo angustatis, venis inconspicuis, margine et costa media ad apicem tantum remotiuscule serrato-denticulatis; auriculis circiter 5 cm. longis, haud liberis, membranaceis, in fibras cito solutis, deciduis. Inflorescentiis terminalibus; spathis caducis; pedunculo communi brevi (0.5–1 cm. longo); syncarpiis oblongo-cylindricis, 3 (in specimine typica) 3 cm. longis, 1.3 cm. latis, pedunculatis; pedunculis 2 cm. longis, laevibus; drupis 4–4.5 mm. longis, confertis, in parte apicali (1–1.5 mm. longa) liberis, truncato-pyramidatis, vulgo pentagonis; summo vertice circiter 0.5 mm. lato, annulo angusto cincto; stigmatibus vulgo 1–3(–5); seminibus 1 mm. longis, raphe parva raphidophora, strophiolo nullo vel subnullo.

British New Guinea: Fly River, 528 Mile Camp, *Brass 6651* (type), May, 1936, climbing to 6–8 m. on ridge-forest substage trees, at 80 m. alt., common (fruit-heads ± 4 cm. long, 1.8 cm. in diameter), *Brass 6657,* May, 1936 (fruit-heads orange-red, to 4.5 cm. long, 2.5 cm. in diameter); Palmer River, 2 miles below Black River Junction, *Brass 6927,* June, 1936, in forest substage, at 100 m. alt. (large climber; leaves somewhat glaucous; fruit-heads brown, to ± 3.5 cm. long, 2 cm. in diameter).

In the collection of Papuan species at hand, *Freycinetia Brassii* might be confused with *F. Hollrungii* Warb. Both have leaves similar in outline, deciduous auricles, internodes ± 1 cm. long, smooth peduncles ± 2 cm. long and berries with free truncate-pyramidal to convex apices. Differential characters of *F. Brassii* are longer leaves, stigmas definitely surrounded by a pale ring and seeds with a small inconspicuous raphe bearing raphides. The seeds of *F. Hollrungii* are 1.5 mm. long with a broad white raphe covering the larger half of the seed.

Freycinetia Hollrungii Warburg, Pflanzenr. **3(IV.9):** 30. 1900, in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 161. 1900; Martelli, Webbia **3:** 311. 1910.

British New Guinea: Western Division, Oriomo River, Dagwa, *Brass 5994,* February 25, 1934, on creek-bank in rain-forest strips, at 40 m. alt., common (scandent, straggling shrub; syncarps reddish pink); Palmer River, 2 miles below Black River Junction, *Brass 7339, 7262,* July, 1936, in the edge of the forest along stable river-banks, at 100 m. alt., plentiful (scrambling over the ground in half shade or climbing a few meters into the trees; leaves smooth and soft; fruit-heads red, very soft and fleshy, the receptacle enlarged).

From Warburg's key, l. c. (also cf. K. Schum. & Lauterb. l. c.), we assume that he separated *Freycinetia Hollrungii* from *F. scandens* Gaud. on account of the difference in the dentations of the leaf-margins, the former being serrate-dentate at the apex and occasionally just above the auricles, the latter serrate-dentate from base to apex. Martelli lists both species from New Guinea and, in a parenthetical remark, excludes *Hollrung 218* from *F. Hollrungii*. Without the original material for examination, we are at a loss clearly to define either. On account of the foliar character, we have tentatively assigned Brass's collections to *F. Hollrungii*. These specimens have practically mature syncarps; in fact, in *Brass 7262* most of the berries have separated leaving the bare receptacles, the longest being 4 cm. long. The berries are about 8 mm. long, with the free angular apex (cf. *F. scandens* Gaudich. in Freyc. Voy. l'Uranie Physic. Bot. *t. 42*. 1826) rounded or depressed-pyramidal; the seeds are 1.5–1.8 mm. long and hardly more than 1 mm. wide, the broad cellular covering of the raphe appearing a little larger than the rest of the seed.

Freycinetia tafaensis sp. nov. § *Oligostigma*.

Folia imbricata, 25–35 cm. longa, 1.5 cm. lata, acuta, subtus longitudinaliter venoso-striata, breviter vaginantia, margine supra basim per breve spatium dentata (dentibus 1.5 mm. longis, acutis), in parte apicali et costa media minute spinuloso-serrata; auriculis membranaceis, ± 4.5 cm. longis, lanceolatis, apice truncatis spinulosisque. Inflorescentiis terminalibus; syncarpiis 4, ~4.5 cm. longis, 1.5 cm. latis, pedunculatis; pedunculis ± 1.5 cm. longis, spinuloso-scabris; baccis immaturis, ± 6 cm. longis, prismaticis; apice (1.5 mm. longo) coriaceo; stigmatibus vulgo 2–3.

BRITISH NEW GUINEA: Central Division, Mount Tafa, *Brass 5001* (TYPE in Herb. New York Bot. Gard.), September 9, 1933, in ridge crest forests, at 2400 m. alt., not uncommon (syncarps 4, pale red, about 4.5 cm. long, 2.5 cm. in diameter. Fruiting season almost over).

The collection suggests a small specimen of *Freycinetia arborea* Gaudich. probably on account of the similarity in the outline of the syncarps and the somewhat angular and truncate hardened apex of the berries; nevertheless, our species may be distinguished at a glance by the smaller size of the syncarps and the fewer stigmas, as well as by other technical characters.

Freycinetia Klossii Ridley, Trans. Linn. Soc. II. Bot. 9: 236. 1916.

BRITISH NEW GUINEA: Fly River, 528 Mile Camp, *Brass 6703, 7014*, May, 1936, common climber in substage layer of ridge-forests, at 80 m.

alt.; Palmer River, 2 miles below Black River Junction, *Brass 6923, 7028, 7082* (♂), *7143,* June, 1936, in forest substage, at 100 m. alt., common (leaves smooth and shining; fruit-heads red, the largest 4.5 cm. long, 2.5 cm. in diameter).

The leaves (about 35 cm. long, 7 mm. wide) of *Brass 6703* and *7014* differ in being about half as wide as in the other collections, but the fruits seem to agree fairly well. Staminate inflorescence: spathes pale yellow, scarcely 5 cm. long, staminiferous part immature; filaments 1 mm. long, anthers rounded?

A species reasonably well marked by the following characters: the auricles when deciduous breaking transversely into fragments; peduncles scabrous only on the angles; the upper fourth part of the drupes not succulent; the strophiole of the seeds lacking or very inconspicuous.

Freycinetia sogerensis Rendle, Jour. Bot. **61:** Suppl. 58. 1923.

British New Guinea: Central Division, Mafulu, *Brass 5178,* October 3, 1933, in oak forests, at 1250 m. alt., very plentiful (shortly scandent, with spreading upturned branches, or rambling amongst undergrowth; flower-spikes white; bracts white at the base; fruit not ripe); Ononge Road, Dieni, *Brass 3908,* April 29, 1933, at 500 m. alt., in forest (much branched root-climber; fruit-heads 4, radial when mature, reddish orange, up to 6 cm. long, 3.2 cm. in diameter).

This species is to be distinguished from *Freycinetia Klossii* Ridley by the following characters: fibres of the shredded auricles more or less persistent; peduncles scabrous; berries with only a narrow hardened ring at the apex; and seeds with both raphe and strophiole obvious.

Without authentic material for comparison, it is with no little hesitation that we have even tentatively assigned these collections to *F. Klossii* Ridl. and *F. sogerensis* Rendle. The description of *F. Klossii* Ridl. is so vague that it might easily be the same species as *F. sogerensis* Rendle. In addition two other descriptions which seem to be very close to these are *F. gladiifolia* Martelli and *F. fibrosa* Martelli. The isotype of the latter in the Arnold Arboretum herbarium differs from the other collections chiefly in the narrower leaves and perhaps in the more profuse fibres of the auricle-remnants. These are certainly close, if not identical, species.

Freycinetia Archboldiana sp. nov. § *Oligostigma.* Pl. I, f. 10.

Ramuli 1.5 cm. crassi; internodiis 1–1.5 cm. longis; foliis subcoriaceis, confertis, imbricatis, 70 cm. longis et ultra, versus basim circiter 2.5 cm. latis, sursum sensim attenuato-acuminatis, basi subamplexicaulibus, crebre longitudinaliter venoso-striatis, versus basim obscure tessellatis,

margine versus basim per spatium breve serrato-dentatis, dentibus 1 mm. longis acutis, sursum obscure denticulatis; costa media in parte superiore remote adpresso-denticulata; auriculis ± 4 cm. longis, 5–7 mm. latis, apice obtusis vel rotundatis, adnatis. Inflorescentiis terminalibus, pedunculo communi 3 cm. longo; syncarpiis (immaturis) 4–7, cylindricis, 7–10 cm. longis, 1.5 cm. crassis, pedunculatis; pedunculis 6–8 cm. longis, bi- (tri-)angulosis, angulis et interdum in parte superiore scabridis; baccis (immaturis) 6 mm. longis, prismaticis, apice (1 mm. longo) non succulentis; stigmatibus 1–3(–5), vulgo 2; seminibus 1 mm. longis, raphe raphidophora alba, strophiolo nullo.

BRITISH NEW GUINEA: Central Division, Bella Vista, *Brass 5458* (TYPE), November 8, 1933, in forest, at 1450 m. alt., common (large climber; syncarps conspicuously marked with horizontal wrinkles; lower part of bracts pale pink).

The leaves are somewhat broken and the margins are strongly revolute. The species suggests *Freycinetia radicans* Gaudich. It is readily distinguished, however, by the several more slender syncarps and the longer and stouter peduncles.

Freycinetia latibracteata sp. nov. § *Oligostigma*.

Folia vix coriacea, ± 85 cm. longa, 3 cm. lata, sursum acuminata, basi paullo dilatata, crebre longitudinaliter venoso-striata, obscure tessellata; laminae margine versus basim per spatium longiusculum (± 15 cm. longum) breviter spinuloso-dentatis, versus apicem denticulatis, caeterum laevibus; costa media in parte superiore remotiuscule minutissime spinulosa; auriculis 7 cm. longis. Spathis exterioribus foliis simillimis sed brevioribus (?), versus basim aliquantum dilatatis et valide venoso-striatis fere sulcatis; interioribus foliis dissimilibus, elongato-ovatis, navicularibus, 17–23 cm. longis, 8–11 cm. latis, venis robustis longitudinaliter percursis, margine et costa media serrato-dentatis; syncarpiis cylindricis, ± 11 cm. longis, ± 1.3 cm. crassis, pedunculatis; pedunculis 6–8 cm. longis, ± scabridiusculis praecipue in angulis, interdum ad apicem laevibus; baccis immaturis, ± 2.5 mm. longis, prismaticis, usque ad apicem succulentis; apice plano, annulo lato stramineo cincto; stigmatibus 1–3, vulgo 2.

NORTHEASTERN NEW GUINEA: Morobe District, Yunzaing, *Clemens 6457* (TYPE), June 19, 1937, at ± 1500 m. alt.; Ogeramnang, *Clemens 4703*, December 12, 1936, at ± 1900 m. alt.

Unfortunately the specimens are somewhat fragmentary and without descriptive field-notes. The type consists of two leaves and two separated syncarps; the second collection shows only three inner spathes and the

basal part of the outer ones and one syncarp. The species is very closely allied to *Freycinetia Archboldiana;* but, in the latter the leaves are a little narrower and shorter, the margins distinctly revolute, and the hardened apical portion of the berries is about twice as deep as in *F. latibracteata.* The spathes of *F. Archboldiana* have already fallen.

Freycinetia undulata sp. nov. § *Oligostigma.* Pl. I, f. 11.

Caulis foliaceus, 1 cm. crassus; internodiis 1.5 cm. longis; foliis confertis, imbricatis, subcoriaceis, 25–40 cm. longis, circiter 4 cm. latis, apice abrupte acuminatis, recurvatis, supra valide, subtus longitudinaliter venoso-striatis, subtus obscure tessellatis, basi amplexicaulibus, vulgo in toto margine spinuloso-dentatis, dentibus patentibus, 1–2 mm. longis; auriculis membranaceis usque ad 8 cm. longis, 1.3 cm. latis, apice obtusis vel rotundatis, adnatis, laevibus. Inflorescentiis ♀ terminalibus; spathis caducis; syncarpiis 3 vel 4, oblongo-cylindricis, immaturis, 5.5–7.5 cm. longis, 1.5–3 cm. crassis, pedunculatis; pedunculis 2–3 cm. longis, laevibus; baccis immaturis, 9–10 mm. longis, obclavatis (probabiliter in maturitate lageniformibus), parte ovuligera superiore sterili paullo breviore; stigmatibus 2–3(–4); staminodiis brevibus, antherarum rudimentis subhastatis. Inflorescentiis ♂ terminalibus; spathis decrescentibus brevibus indutis, exterioribus majoribus 12 cm. longis, versus basim 6 cm. latis, margine in dimidia parte superiore spinuloso-dentata; interioribus brevioribus subcarnosis; spadicibus 3, parte staminifera cylindrica, 5 cm. longa; filamentis ± 3 mm. longis; antheris pusillis, late oblongis.

British New Guinea: Palmer River, 2 miles below Black River Junction, *Brass 6930* (type), June, 1936, restricted to river-bank forests, at 100 m. alt., common (very striking species with leafy stems closely appressed to the tree trunks; leaves of soft texture, wrinkled or undulate, purple beneath until old; flower-bracts bright yellow; flower-spikes pink).

This species is well marked by oblong leaves with short falcate apices and undulate spinulose-dentate margins, rather large brownish and membranous auricles (adnate to the apex), and very slender berries.

Freycinetia tessellata sp. nov. § *Oligostigma.*

Folia subcoriacea, 80–120 cm. longa, 6–7 cm. lata, crebre et longitudinaliter venoso-striata, utrinque venis circiter 45, perspicue tessellata, apice fere abrupte acuminato-subulata, acumine ± 3 cm. longo, margine supra basim per breve spatium serrato-dentatis, versus apicem serrato-denticulatis; costa media subtus vulgo in parte superiore remotiuscule serrato-denticulata; auriculis membranaceis, ± 13 cm. longis, acumi-

natis, haud liberis. Inflorescentiis ternis; pedunculo communi 12 cm. longo, laevi; syncarpiis clavato-cylindricis, ± 10 cm. longis, 3 cm. crassis, pedunculatis; pedunculis ± 3 cm. longis, praecipue in parte apicali scabris; baccis numerosissimis, immaturis, 7–8 mm. longis, 0.5 mm. crassis, prismaticis, apice convexis; stigmatibus 2–4, annulo angusto cinctis.

SOLOMON ISLANDS: Ysabel, Maruto, *Brass 3384* (TYPE), December 25, 1932, rain-forest, at 300 m. alt. (very large robust climber; leaves very dark green, midrib and margins near apex whitish; winged base pale with dark green nerves; fruit-heads slightly flattened; the largest *Freycinetia* on the island); Ysabel, Meringe, *Brass 3176,* November 22, 1932, common; San Cristoval, Star Harbor, *Brass 3122*, October 28, 1932; rocky hillside near the sea (very large robust plant straggling over rocks in rain-forest; fruit-heads 3, 10 cm. long, 3.5 cm. in diameter; drupes red, very slender).

This species is very closely related to *Freycinetia ponapensis* Martelli (*F. carolinensis* Kanehira, cf. Bot. Mag. Tokyo **51**: 906. 1937); it differs in the broader and somewhat more abruptly acuminate leaf-tips and in the scabrous peduncles of the syncarps.

Section PLEIOSTIGMA

Freycinetia oreophila sp. nov. § *Pleiostigma.* Pl. I, f. 4.

Ramuli ± 7 mm. crassi; internodiis 1–1.5 cm. longis; foliis membranaceo-coriaceis, 15–25 cm. longis ± 1.5 cm. latis, sursum sensim acuminatis, subtus longitudinaliter venoso-striatis, semiamplexicaulibus; laminae margine versus basim et apicem ± serrato-denticulatis, caeterum laevibus; costa media fere a medio usque ad apicem minutissime spinulosa; auriculis 2–2.5 cm. longis, membranaceis, apice acuminatis, adnatis. Inflorescentiis terminalibus; spathis caducis (non vidimus); syncarpiis 6, globosis, immaturis 1.5 cm., maturis 3.5 cm. crassis, pedunculatis; pedunculis circiter 2 cm. longis, laevibus; baccis sublageniformibus, liberis, 12 mm. longis, ± 4 mm. crassis, apice 5 mm. longo, anguloso, pyramidato, truncato, annulo angusto cincto; stigmatibus 3–6(–10) in circulo dispositis vel biseriatis; seminibus 2.5 mm. longis, 0.6 mm. crassis, raphe 0.4 mm. lata, strophiolo nullo.

NORTHEASTERN NEW GUINEA: Morobe District, Bulung River, *Clemens 5344* (TYPE), February 9, 1937, at ± 900 m. alt.; Yunzaing, *Clemens 3543,* July 4, 1936, at ± 1650 m. alt.

This species is very much like *Freycinetia lagenicarpa* Warburg as to the description of the fruit-heads. However, in our material the apex of

the berries is longer, the leaves are about twice as broad and equitant only at the apex of the branchlets, and the branchlets are not particularly acute-angled. Unfortunately, we have no authentic material of *F. lagenicarpa* for comparison.

Freycinetia linearifolia sp. nov. § *Pleiostigma.*

Freycinetia sp. Martelli, Jour. Arnold Arb. **10**: 137. 1929; White, op. cit. 202.

Ramuli 3–4 mm. crassi, trigoni; internodiis 5–6 mm. longis, laevibus; foliis linearibus, subcoriaceis, 12–25 cm. longis, 4–6 mm. latis, acuminato-subulatis, basi vix angustatis, semiamplexicaulibus, margine (in foliis novellis minute spinuloso-serratis) ad basim apicemque tantum et costa media subtus in parte superiore serrato-dentatis; auriculis scarioso-membranaceis, ± 1 cm. longis, versus apicem fimbriatis, cito solutis, caducis. Inflorescentiis interdum in ramulis brevibus terminalibus; spathis usque ad 4 cm. longis, 2 cm. latis, caducis; syncarpiis immaturis, 4–8 mm. longis, 3–6 mm. crassis, pedunculatis; pedunculis vix 1 cm. longis, laevibus; baccis 2 mm. longis, prismaticis; stigmatibus 4–6, confluentibus.

British New Guinea: Fly River, 528 Mile Camp, *Brass 6698* (type), May, 1936, on lower trunk of substage trees, at 80 m. alt., plentiful (flower-bracts pale green; fruit-heads unripe, almost globose, ± 1 cm. in diameter); Gulf Division, Murua River, *Brass 1332.*

This species differs from the description of *Freycinetia lagenicarpa* Warburg in the fimbriate margins of the auricles, and in having confluent stigmas (at least in our immature specimens). It is also very close to *F. Gibbsiae* Rendle, but the fertile branches are not always dwarf-like, and the caducous spathes are much smaller than in the latter species.

Freycinetia stenodonta sp. nov. § *Pleiostigma.*

Rami circiter 5 cm. diametro, scabridiusculi; internodiis ± 1 cm. longis; foliis dissitis, patulis, coriaceis, elongato-ovatis, 4–6 cm. longis, 2–3 cm. latis, obtuse apiculatis, longitudinaliter minute venoso-striatis, basi amplexicaulibus, margine et costa media subtus spinuloso-dentatis; auriculis membranaceis, spinuloso-dentatis, cito caducis, ± 5 mm. (?) longis, 2 mm. latis. Inflorescentiis apice ramulorum brevium dispositis; spathis caducis; pedunculo communi brevissimo; syncarpiis 4, immaturis, vix 1 cm. longis, 4–5 mm. crassis, maturitate 2.5 cm. longis, 1.5 cm. (?) crassis, pedunculatis; pedunculis 1.5–2 cm. longis, laevibus; baccis usque ad apicem succulentis, oblongis, ± 4 mm. longis; apice rotundato-pyramidato; stigmatibus 2–5; seminibus leviter falcatis, vix 1 mm. longis, raphe raphidophora et strophiolo albis cinctis.

BRITISH NEW GUINEA: Central Division, Ononge Road, Dieni, *Brass 3838* (TYPE in Herb. New York Bot. Gard.) on rain-forest trees, at 500 m. alt., common (small root-climber; leading shoot flatly attached to the host-trees by adventitious roots; branches drooping).

This species suggests *Freycinetia sphaerocephala* Gaudich. in general habit. It is readily separable, nevertheless, by several characters. The leaves are much broader with more definitely spinulose margin; the auricles are narrower and disappear very early so that only the scar or the broken margin remains. The syncarps are cylindric and although the specimen of mature fruit is old and difficult to interpret, the berries are certainly much more crowded on the syncarp than in *F. sphaerocephala*. The seeds too are quite different, those of the latter species being longer, almost straight and easily distinguished by the broad white raphe (the strophiole practically lacking). In *F. stenodonta* the strophiole is scarcely half as thick as the rest of the seed and the raphe is relatively inconspicuous except for the two rows of raphides borne by it.

Freycinetia salamauensis sp. nov. § *Pleiostigma*. Pl. I, f. 7.

Ramuli ± 5 mm. crassi; internodiis 1 cm. longis, laevibus; foliis oblongo-lanceolatis, 4–9 cm. longis, 2–3 cm. latis, apice acuminatis, utrinque longitudinaliter venoso-striatis, basi abrupte angustatis, amplexicaulibus, margine versus apicem basimque et costa media spinulosodentatis; auriculis scarioso-membranaceis, margine spinulosis, caducis. Inflorescentiis terminalibus; pedunculo communi ± 5 mm. longo; syncarpiis 4–5, immaturis, 1–1.6 cm. longis, 4–7 mm. crassis, maturis 6 cm. longis, 1.5 cm. crassis, pedunculatis; pedunculis 2–2.5 cm. longis, angulosis, angulis apiceque ± hispidulis vel strigulosis; baccis immaturis prismaticis; apice plano; stigmatibus 2–6, saepissime 3, annulo angusto cinctis; maturis ± 3 mm. longis, usque ad apicem succulentis; seminibus vix 1 mm. longis, raphe et strophiolo latis.

NORTHEAST NEW GUINEA: Mayen, *Schlechter 17910*, July 6, 1908, at 50 m. alt.; Morobe District, Sattelberg, Salamaua, *Clemens 28* (TYPE), August 27, 1935, forest margin, at 300 m. alt.

The description of *Freycinetia Biroi* Warburg is very like that of *F. salamauensis*. In the former, however, the common peduncle is 2.5 cm. long, those of the syncarps are 1 cm. long and smooth; whereas, in the latter the common peduncle is 5–8 mm. long and those of the syncarps are 2.5 cm. long, also the angles and the apex are hispidulous.

Freycinetia anomala sp. nov. § *Pleiostigma*. Pl. I, f. 8.

Ramuli 6 cm. crassi; internodiis ± 2 cm. longis; foliis lineari-lanceolatis, circiter 18 cm. longis, 1.2–1.5 cm. latis, apice sensim acuminatis,

supra obscure, subtus longitudinaliter crebre minuteque venoso-striatis; versus basin angustatis, fere plicatis, subito latioribus, amplexicaulibus; margine et costa media saepissime inermibus; auriculis cito deciduis, membranaceis, ambitu rotundatis. Inflorescentiis terminalibus, pedunculo communi 1 cm. longo; syncarpiis (immaturis) 4, cylindricis, 4 cm. longis, 1 cm. crassis, pedunculatis; pedunculis circiter 4 cm. longis, laevibus; baccis (immaturis) prismatico-cylindricis, (tetra–)pentagonis, ± 5 mm. longis, 3–4 mm. crassis, liberis, succulentis, parte apicali brevi (± 2 mm.), ± rotundatis, infra stigmata paullo constrictis; stigmatibus 3–6, vulgo 4–5, pulvinatis; seminibus immaturis; staminodiis vix 0.5 mm. longis.

Solomon Islands: San Cristoval Island, Hinuahaoro, *Brass 2886,* (type), September 22, 1932, mountain-forests, at 900 m. alt., common (large climber; leaves thick and rather fleshy, quite unarmed).

A well marked species; syncarps cylindric, the numerous berries crowned by a group of convex, ± cushion-like stigmas unlike any others examined; seeds immature, crescent-shaped. Leaves unarmed, the base somewhat expanded and amplexicaul. Only remnants of the auricles remain attached to the specimen.

Freycinetia pectinata sp. nov. § *Pleiostigma.*

Ramuli 6 cm. crassi; foliis linearibus, 15–20 cm. longis, 9 mm. latis, sursum attenuato-acuminatis, basi breviter vaginantibus, subtus longitudinaliter crebre minuteque venoso-striatis, margine supra basim per spatium breve breviter pectinato-dentatis, in parte media inermibus, in parte superiore revolutis et minutissime denticulatis; costa media fere e medio usque ad apicem minute adpresso-dentata; auriculis membranaceis, ± 2 cm. longis, deciduis vel subpersistentibus, apice rotundatis, pectinatis. Inflorescentiis terminalibus; syncarpiis 4, cylindraceis, circiter 4 cm. longis, 1.5 cm. crassis, pedunculatis; pedunculis ad apicem squamuloso-scabridis, angulis squamuloso-denticulatis; drupis (immaturis) sublageniformibus, liberis, 5 mm. longis; vertice plano, annulo angusto cincto; stigmatibus 4–6(–12), vulgo in circulo dispositis.

Solomon Islands: Ysabel Island, Kakatio, *Brass 3247* (type), December 1, 1932, climbing on rain-forest trees, at 900 m. alt., common.

The striking character of this species is the pectinate margin of the auricle-apices and (for a short space) the adjoining margins of the leaves. The syncarps show some resemblance to those of *Freycinetia Hombronii* Martelli of Samoa, but the latter are shorter and broader than in our species.

Freycinetia divaricata sp. nov. § *Pleiostigma.* Pl. I, f. 2.

Ramuli 6 cm. crassi, internodiis ± 8 mm. longis, scabridiusculis; foliis lineari-lanceolatis, 16–18 cm. longis, 1.5–2 cm. latis, apice sensim acuminatis, semiamplexicaulibus, dissitis, patenti-ascendentibus, obscure venosis, margine versus basim et apicem minute dentato-serratis; costa media in parte superiore remote spinulosa; auriculis in fibras cito solutis, 1.5–2 cm. longis, deciduis. Inflorescentiis terminalibus; pedunculo communi circiter 5 mm. longo; syncarpiis ovato-ellipsoideis, ± 3 cm. longis, 2 cm. crassis, pedunculatis; pedunculis ± 2 cm. longis, laevibus; baccis circiter 6 mm. longis, lageniformibus, in parte superiore liberis; apice subplano, annulo cincto; stigmatibus 3–4; seminibus 1.2 mm. longis, paullo incurvis, raphe et strophiolo albis, crassiusculis.

SOLOMON ISLANDS: Florida Islands (N'Gela), Olevuga Island, *Brass 3480* (TYPE), January 16, 1933, common in swampy lowland forests (climber of stiff divaricate branching habit; stems brown; leaves somewhat glaucous beneath; fruit-heads about 3.5 cm. long, 2 cm. in diameter).

The general habit of this specimen suggests *Freycinetia scandens* Gaudich., at least as to *plate 42* (Freyc. Voy. l'Uranie Physic. Bot. 1826), but the leaves are unarmed except at the apex and the base, and the berries appear to be more elongate at the apex.

Freycinetia marantifolia Hemsley, Kew Bull. 164. 1896; Warburg, Pflanzenr. **3(IV.9):** 36. 1900; Martelli, Webbia **3:** 312. 1910.

SOLOMON ISLANDS: San Cristoval Island, Hinuahaoro, *Brass 2932,* September 22, 1932, climbing on forest trees, at 900 m. alt.; Ysabel Island, Suwa, *Brass 3230,* November 26, 1932, climbing in rain-forest, at 300 m. alt., common (lower surface of leaf-base pink; fruit-heads up to 5 cm. long, 3.5 cm. in diameter; drupes red tipped with green).

Freycinetia decipiens sp. nov. § *Pleiostigma.*

Ramuli circiter 5 mm. crassi; internodiis ± 1.5 cm. longis, granulari-scabridiusculis; foliis subcoriaceis, oblongis, 13–18 cm. longis, 2.5–3.5 cm. latis, utrinque angustatis, apice breviter acuminatis, basi 0.5–1 cm. latis, semiamplexicaulibus, ± 36-nerviis, margine fere laevibus, apice tantum denticulatis; auriculis caducis (non vidimus). Inflorescentiis terminalibus; spathis caducis; syncarpiis 2(–4), ellipsoideis, ± 2 cm. longis, ± 1.5 cm. crassis, pedunculatis; pedunculis circiter 2.5 cm. longis, angulis scabridiusculis; baccis prismaticis (?), ad apicem succulentis; apice libero, breviter pyramidato, anguloso; vertice convexo, annulo prominulo cincto; stigmatibus 3–6; seminibus 1.4 mm. longis, paullo

curvatis, raphe raphidophora, strophiolo manifesto (0.2 mm. lato).

SOLOMON ISLANDS: San Cristoval Island, Star Harbor, *Brass 3138* (TYPE), October, 1932, climbing on trunk of rain-forest tree, at 50 m. alt., *Brass 3113,* October 28, 1932, in hill rain-forests, at 50 m. alt., common (bracts very thick and fleshy, cream-colored with paler tips).

This species looks very much like *Freycinetia marantifolia* Hemsl. The latter, however, has smooth internodes, and the stigmatic part of the apex of the berries is flat rather than convex as in *F. decipiens.*

Freycinetia funicularis (Savigny) Merr. Interpret. Rumph. Herb. Amboin. 83. 1917.

Pandanus funicularis Savigny in Lam. Encycl. **4**: 735. 1798.

Freycinetia strobilacea Blume, Rumphia **1**: 156, *t. 39.* 1835; Schnizlein, Icon. **1**: *t. 71, f. 3–5.* 1846; Solms Laubach, Ann. Jard. Bot. Buitenz. **3**: 99. 1883; Warburg in Engler Pflanzenr. **3(IV.9)**: 34. 1900; Martelli, Webbia **3**: 315. 1910.

SOLOMON ISLANDS: San Cristoval, Hinuahaoro, *Brass 3016, 3017,* September 16 and 22, 1932, in mountain rain-forests at 900 m. alt.

Type from Amboina; reported also from New Guinea.

Our collections, at least as to foliar characters are a good match for the Amboina material. We were unable to locate a description of the fruit of this species, although Warburg notes that the fruit is eaten by natives. In the specimen, *Brass 3017,* the infructescence consists of one syncarp and the base of another on peduncles 3–3.5 cm. long, supported by a common peduncle about 2.5 cm. long.

Syncarp 12 cm. long, 2 cm. thick, approximately cylindric; drupes ± obpyriform and free, the apex truncate-pyramidal with the uppermost 2 mm. subligneous or coriaceous; stigmas 4–6, arranged ± in a circular manner, separated and surrounded by a smooth, narrow, light-colored and often shiny margin; seeds linear, ± 2.5 mm. long, 0.4 mm. wide, raphe 0.2 mm. thick, a little longer than the rest of the seed and about the same color.

If our material is correctly named, *Freycinetia funicularis* belongs to the section *Pleiostigma.* In several characters Ridley's *F. rhodospatha* agrees with this species, but we have no authentic material for comparison.

Freycinetia oligodonta sp. nov. § *Pleiostigma.*

Ramuli circiter 7 mm. crassi; internodiis 4 mm. longis; foliis ad apicem ramorum confertis, imbricatis, 25–30 cm. (et ultra?) longis, 1–1.3 cm. latis, apice acuminatis, utrinque longitudinaliter crebre venoso-striatis, inconspicue tessellatis, basi vaginantibus; margine et costa media inermi-

bus, apice tantum interdum remote denticulatis; auriculis scarioso-membranaceis, 2–3 cm. longis, apice truncatis vel obtusis, adnatis. Inflorescentiis terminalibus; syncarpiis immaturis, 3, cylindricis, vix 2.5 cm. longis, 1.2 cm. crassis, pedunculatis; pedunculis 3.5–4 cm. longis, laevibus; baccis (immaturis) prismaticis vel ± cuneatis, liberis; stigmatibus circiter 4–8, ± confluentibus; staminodiis brevissimis (0.4 mm. longis).

SOLOMON ISLANDS: San Cristoval Island, Hinuahaoro, *Brass 2930* (TYPE), September 22, 1932, in mountain rain-forests, at 900 m. alt., common (large climber; leaves somewhat fleshy, very smooth, with winged transparent sheathing base very conspicuously veined).

Although suggesting *Freycinetia Hombronii* Martelli, *F. oligodonta* is clearly a distinct species easily recognized by the almost entire leaves with thinly membranaceous auricles and the smooth peduncles.

Freycinetia nesiotica sp. nov. § *Pleiostigma.* Pl. I, f. 6.

Ramuli 7 mm. crassi; internodiis ± 1 cm. longis, laevibus; foliis imbricatis, coriaceis, ± 60 cm. longis, 1–1.5 cm. latis, linearibus, versus apicem longe attenuato-acuminatis, basi vaginantibus, utrinque longitudinaliter venoso-striatis, margine ± revolutis, supra basim per breve spatium serrato-denticulatis, versus apicem serrulatis; costa media in parte superiore minute spinulosa; auriculis in fibras cito solutis, ± deciduis, circiter 3 cm. longis. Inflorescentiis ♀ terminalibus, pedunculo communi 1.5 cm. longo; syncarpiis 3, ellipsoideis, 4 cm. longis, 3 cm. crassis, pedunculatis; pedunculis 2.5 cm. longis, angulosis, angulis et apice squamuloso-scabridis; baccis ± 1 cm. longis, angulato-obclavatis, versus apicem non succulentis; vertice plano; stigmatibus 4–6, quoque annulo angusto cincto; seminibus 2 cm. longis, vulgo rectis, raphe crassa, strophiolo nullo.

SOLOMON ISLANDS: San Cristoval Island, Hinuahaoro, *Brass 2929* (TYPE), September 22, 1932, in mountain rain-forests, at 900 m. alt., common (robust climber with very dark green fruit on rigid peduncles).

Superficially this species is very similar to *Freycinetia membranacea,* but the leaves are distinctly coriaceous, the berries are fewer to a syncarp, a little shorter and slightly thicker than those of the latter species and the seeds are a little plumper, being about 0.6 mm. in diameter (those of *F. membranacea* are about 0.4 mm. thick and often bear raphides).

Freycinetia membranacea sp. nov. § *Pleiostigma.* Pl. I, f. 5.

Ramuli 7–10 mm. crassi; internodiis 1.5–2 cm. longis; foliis imbricatis,

membranaceis, ± 60 cm. longis, 1.5 cm. latis, longitudinaliter venoso-striatis, apice acuminatis, basi vaginantibus; margine supra basim per spatium breve denticulatis, versus apicem incerte denticulatis; costa media subtus in parte superiore minute spinulosa vel serrata; auriculis submembranaceis, fragilibus, fragmentis caducis. Inflorescentiis ♀ terminalibus, pedunculo communi 7 cm. longo; syncarpiis 3, ellipsoideis, 6 cm. longis, 3.5 cm. crassis, pedunculatis; pedunculis 2.5–3 cm. longis, angulosis, angulis scabridis; baccis ± 12 mm. longis, versus basim connatis, obclavatis vel sublageniformibus, apice (4–5 mm. longo) prismaticis, vertice plano; stigmatibus 4–6, quoque annulo angusto cincto; seminibus 1.5–2 mm. longis, vulgo rectis, raphe crassa, strophiolo nullo.

Solomon Islands: Bougainville, Siwai, *Waterhouse 168* (type in Herb. New York Bot. Gard.), December, 1932 (trailing shrub with striking white blossom).

In habit this species strongly resembles *Freycinetia nesiotica*. It differs, however, in the membranaceous texture of the leaves and possibly of the auricles (those of the latter species splitting lengthwise into fibres, those of *F. membranacea* breaking transversely into pieces), the larger syncarps and the much longer common peduncle.

Kajewski 2184, Marmaromino, Buin, Bougainville Island, September 28, 1932, at 50 m. alt. (common plant climbing well up rain-forest trees; leaves with very small serrations; fruit-heads 4 cm. long, 2.2 cm. in diameter, red when ripe), may also belong here. The leaves and the auricles are similar to those of this species; the fruit-heads are very young but the angles of the secondary peduncles are smooth.

Freycinetia petiolacea sp. nov. § *Pleiostigma.*

Ramuli 4–9 mm. crassi, obtuse angulati; internodiis 1.5–2 cm. longis; foliis lanceolatis (3.5–)5 cm. latis, ± 35 cm. longis, subamplexicaulibus, versus basim longe angustatis et acute plicatis, ad apicem abrupte caudato-acuminatis, longitudinaliter venoso-striatis; margine fere integro, ad apicem serrulato; costa media subtus acuta in apice serrulata; auriculis 5–7 cm. longis, membranaceis, in fibras tandem solutis. Inflorescentiis terminalibus; spathis caducis; pedunculo communi ± 7 cm. longo; syncarpiis 2–3, ellipsoideis, usque ad 5 cm. longis, 2 cm. crassis, pedunculatis; pedunculis ± 1.5 cm. longis, laevibus; baccis liberis, oblongis, immaturis, 6 mm. longis, apice subplano; stigmatibus 3–10, annulo duro stramineo cinctis.

Solomon Islands: Ysabel Island, Kakatio, *Brass 3256* (type), December 1, 1932, at 900 m. alt.; San Cristoval Island, Hinuahaoro, *Brass 2931,* September 22, 1932; Bougainville Island, Koniguru, Buin,

Kajewski 2147, August 24, 1930, at 900 m. alt. Climbing on forest-trees.

The leaves of *Freycinetia petiolacea,* although larger, are very much like those of the Fijian *F. caudata* Hemsl. both in the caudate apex and in the long (8–10 cm.) plicate basal portion, but the syncarps are easily separable in the two species: those of the first are ellipsoid with fairly long berries; whereas, those of the second are narrowly cylindric with much shorter and more uniform berries.

Freycinetia pseudo-insignis Warburg, Pflanzenr. **3(IV.9):** 33. 1900, et in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee, Nachtr. 52. 1905; Martelli, Jour. Arnold Arb. **10:** 138. 1929; White, op. cit. 201.

Freycinetia insignis Bl. aff. K. Schum. & Hollrung, Fl. Kaiser Wilhelms Land 18. 1889.

Freycinetia novo-guineensis Warburg, Pflanzenr. **3(IV.9):** 34. 1900, pro parte (fide Martelli, Webbia **3:** 313. 1910).

BRITISH NEW GUINEA: Central Division, Mount Tafa, *Brass 4964,* September 3, 1933, in valley forest, at 2400 m. alt., very plentiful (very large root-climber ascending tall trees and sending out numerous stout upturned branches; branches 3.5–4 cm. in diameter close below the leafy top; leaves numerous at branch ends, in three series, of soft texture, somewhat glaucous beneath; margins and apex of young leaves purple. As many as seven large immature syncarps pendent on flexible peduncles; the largest syncarp measured 16 cm. × 4.5 cm., the smallest 9 cm. × 3.8 cm.; base of drupes orange-red, apex green); Central Division, Ononge Road, Dieni, *Brass 3850,* April 22, 1933, in rain-forests, at 500 m. alt., common (fine large root-climber; stems not much branched, 3.5 cm. diameter 1 m. below the fruiting top; leaves very dark, shining, in three series, lower surface striate, average length about 1.4 m. long, 6 cm. wide, sheathing the stem for about 8 cm.; leaves immediately below the inflorescence slightly shorter and broader and red at the base; inflorescence 3, upright, reddish pink; cylindric heads 17 cm. long, 5 cm. in diameter).

These specimens appear to be a good match for *Brass 1052* named by Martelli. Unfortunately none of the specimens show mature fruit. There can be no doubt, however, that this species belongs to the section *Pleiostigma* rather than to *Oligostigma.* The drupes are ± obclavate and angular with a flat apex bearing 4–6(–10) stigmas.

Somewhat hesitantly we add here the following collection: *Brass 7426,* Oroville Camp, Fly River (30 miles above D'Albertis Junction) (ascending to upper branches of rain-forest canopy trees; outer bracts purple, inner orange-red). This differs from the other collections in its obviously

narrower leaves. The anthers of the ♂ inflorescence are about 3 mm. long. The ♀ inflorescences are immature but they appear to be much like those of *Brass 1052*.

Freycinetia laeta sp. nov. § *Pleiostigma*. Pl. I, f. 1.

Folia numerosa, coriacea, ± 140 cm. longa, 7.5 cm. lata, versus apicem breviter acuminata, acumine ± 2.5 cm. longo, versus basim paullo angustata (5 cm. lata), in pagina inferiori tessellata; margine in parte media laevibus, ceterum remotiuscule serrato-dentatis; costa media subtus prominente, versus apicem tantum remotiuscule serrato-dentata; auriculis 25–30 cm. longis, vix 3 cm. latis, submembranaceis, acuminatis, in sicco atro-fuscis. Spathis exterioribus foliis simillimis sed multo brevioribus, versus basim aurantiacis, interioribus carnosulis, roseis, late ovatis, ± 22 cm. longis, 8–9 cm. latis, apice abrupte acutis vel acuminatis vel cuspidatis. Inflorescentiis ♀ ternis; pedunculo communi ± 1 cm. longo; syncarpiis novellis 5–7 cm. longis, 1–1.5 cm. crassis, versus maturitatem oblongis, 14 cm. longis, 4 cm. crassis, pedunculatis; pedunculo 3–3.5 cm. longo, juxta syncarpium scabridiusculo; drupis 2 cm. longis, linearibus, in parte apicali (4 mm. longa) liberis, anguste truncato-pyramidatis; stigmatibus 3–12 et ultra, vulgo biseriatis; seminibus 1.4 mm. longis, 0.4 mm. latis, rectis; raphe raphidophora, strophiolo nullo. Inflorescentiis ♂ ternis; pedunculis 3.5 cm. longis, laevibus; parte staminifera 6 cm. longa, cylindracea; staminibus plurimis, filamentis 4 mm. longis, antheris parvis, oblongis.

British New Guinea: Palmer River, 2 miles below Black River Junction, *Brass 7031* (type), June, 1936, at 100 m. alt., common (magnificent climber ascending halfway up trunks of large canopy trees; leaves numerous; basal parts of the outer bracts of the inflorescence orange-yellow, the fleshy inner bracts pink; ♀ flower-spikes greenish white, ± 8 cm. long, 2.5 cm. in diameter).

In habit this species suggests *Freycinetia pseudo-insignis* Warb., but differs in the broader leaves with somewhat more abruptly acuminate apex, the larger auricles, and the usually biseriate arrangement of the several stigmas.

Warburg's *Freycinetia polystigma* with biseriate stigmas is probably a close ally of *F. laeta*, but the spathe subtending the spadix is very much narrower than those in our species.

Freycinetia percostata sp. nov. § *Pleiostigma*. Pl. I, f. 12.

Rami circiter 2 cm. crassi; foliis imbricatis, infra infructescentiam ± 70–75 cm. longis, 2.5–3 cm. latis, apice sensim longe attenuatis, longitudinaliter crebreque venoso-striatis, basi amplexicaulibus, margine

versus basim dentibus patentibus brevibus subulatis armatis, caeterum brevissime serrato-denticulatis; costa media subtus (basi excepta) brevissime serrato-denticulata; auriculis 7 cm. longis, apice (1.5 cm.) liberis, obtusis, spinoso-denticulatis. Infructescentiis terminalibus: syncarpiis 3–4, elongato-cylindraceis, 13.5 cm. × 2.4 cm. (novellis) –21 cm. × 4 cm. (in maturitate), pedunculatis; pedunculis 4–5.5 cm. longis, scabris; baccis numerosissimis, confertis, 2 cm. longis, 4–6 mm. latis, 2 mm. crassis, compressis, infra apicem coriaceum seminiferis, in parte superiore truncato-pyramidatis, longitudinaliter et irregulariter 5–6 costis carinatis notatis; vertice plano, ambitu oblongo (2 mm. longo, 1 mm. lato), annulo prominulo cincto; stigmatibus (4–)8–12(–20), biseriatis; seminibus minutis, 1.5 mm. longis, 0.5–0.6 mm. latis, raphe et strophiolo angusto inconspicuis.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass 7860* (TYPE), September, 1936, a few plants climbing high on rain-forest trees (stems not twisted, thus showing clearly the 3-ranked phyllotaxy; leaves glaucous; fruit-heads 3 or 4, up to 24 cm. long, 6 cm. in diameter; berries green with a red apex). SOLOMON ISLANDS: Bougainville Island, Koniguru, Buin, *Kajewski 2131*, at 950 m. alt.

The plant from Bougainville Island is an immature and poorly preserved specimen, but it hardly seems to differ from the New Guinean collection except that the dentations of the leaf-margins are not so closely appressed. The species shows some resemblance to *Freycinetia longispica* Martelli from New Caledonia. The latter differs, however, in the much longer common peduncle, the fewer stigmas, the more obtusely angled drupes, and also in the acuminate membranaceous auricles and the less dentate leaf-margins.

Pandanus Linnaeus

Section KEURA

Pandanus capitellatus sp. nov. § *Keura*. Pl. II, f. 7.

Planta recta, usque ad 6 m. alta; trunco 5–6 cm. diametro. Foliis infra spadicem ± 1.3 m. longis, 1.5 cm. latis, linearibus, apice sensim acuminatis, basi dilatatis, amplexicaulibus; margine serrato-dentato, dentibus brevibus, acutis; costa media subtus obtusa, in parte inferiore inermi, apicem versus denticulata; plicis lateralibus versus apicem denticulatis. Syncarpio solitario, oblongo-ovoideo, 9–12 cm. longo, 7 cm. lato, a plurimis phalangibus compactis formato; phalangibus in tertia parte superiore liberis, 3–4 cm. longis, 1.7–2.5 cm. latis (in parte superiore), cuneatis, in parte inferiore angustatis, apice subrotundatis, superne vix

in pyramidem elevatis; loculis circiter 4–6, subaequalibus; stigmatibus paullo elevatis, 2–3 mm. latis, horizontaliter rotundato-hippocrepiformibus; endocarpio osseo, in dimidia parte superiore phalangis locato; mesocarpio supero compacte medulloso-fibroso.

Solomon Islands: Ysabel Island, Tatamba, *Brass 3414* (type), January 3, 1933, in hardwood forests, at 50 m. alt., common (erect slender tree up to 6 m. tall; trunk 5–6 cm. in diameter, supported on thick prop-roots; stem branched near the top and bearing numerous short blunt prickles; leaves numerous, stiff, glaucous-green on the lower surface; drupes glaucous).

The syncarp of this species superficially suggests *P. Kanehirae* Martelli. The formation of the phalanges with 4–6(–7) drupes is distinctly visible on account of the deep furrows that separate the drupes, and the cross section of the endocarp is irregularly stellate. Nevertheless, *P. capitellatus* differs from *P. Kanehirae* in the oblong syncarp, the more uniform and smaller phalanges, and the quite different apices of the drupes. In *P. Kanehirae* the apex is a small flat areola (probably to be regarded as part of the style) with the stigma excentric; in our species the stigmatic disk is slightly elevated and more or less reniform to rounded in outline.

Pandanus Kaernbachii Warburg, Pflanzenr. **3(IV.9):** 49, *f. 13D.* 1900; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 159. 1900; Martelli, Webbia **4:** 18, *t. 6, f. 3–4.* 1913.

British New Guinea: Sturt Island, Lower Fly River, *Brass 8139,* October, 1936, abundant in substage of flood-plain rain-forests (stem 8–10 m. long, supported on flying buttress-roots, and with a few short terminal branches forming a small crown; leaves pliant, somewhat glaucous; fruit-heads terminal, 1–2 or 3 to each peduncle; individual fruit-heads subglobose, ± 17 × 16 cm.; drupes syncarpous, orange-red).

The phalanges of the above cited collection correspond fairly well with Martelli's figures of this species. The leaves are ± 1.9 m. long, 8–8.5 cm. broad, longitudinally striate in the upper part becoming smooth toward the base, with dentate-serrate margins, and a short bluntly acuminate apex. In Warburg's key this species is classified under solitary syncarps. The field-note given above indicates that this character is variable.

Pandanus scabribracteatus Martelli, Jour. Arnold Arb. **10:** 139. 1929, White, op. cit. 202.

British New Guinea: Western Division, Oriomo River, Wuroi, *Brass 5893,* February 6, 1934, river-bank forest tree, at 5 m. alt., not common (erect, 6–7 m., with branched top; prop-roots absent; trunk and

branches somewhat prickly; leaves soft-textured, glaucous, up to about 1.8 m. long, the edges turned downwards so that the leaf takes the form of the letter M in cross section; one branch bore two terminal leafy shoots, one with 3, the other with 4 syncarps in racemose arrangement, drooping and hanging amongst the leaves; average syncarp 15 × 11 cm.; drupes connate in clusters, glaucous purple over orange-red).

Although the type, *Brass 987,* shows only very young fruits, a careful comparison of the two as to foliar and inflorescence-characters has led to the conclusion that both represent the same species. The fruits of *Brass 5893* are still immature; the phalanges (3.5 cm. long, 2–2.5 cm. broad, 1.5 cm. thick, the free apex 0.5 cm. high) are somewhat flattened at the apex and here divided into short convex- or depressed-pyramidal apices with slightly elevated stigmas, locules 8–9.

Among the New Guinean species this seems most like *P. Kaernbachii* but in the latter the syncarps are subglobose rather than oblong, and the phalanges have a more rounded and longer free apex than those of *P. scabribracteatus.*

Pandanus novo-hibernicus (Martelli) Martelli, Webbia **4**(1): 25. 1913, **4**(2): *t. 39, f. 1–5.* 1914.

Pandanus tectorius Soland f. *novo-hibernica* Martelli, Bot. Jahrb. **49**: 63. 1912.

SOLOMON ISLANDS: San Cristoval Island, Kira Kira, *Brass 2837,* a river-bank species, not common (tree 6–7 m. tall, stem solitary with thick, crooked, ascending branches very flat at their insertion on the stem; trunk supported on thick prickly aërial roots; stem and branches with scattered short thick prickles; younger branches smooth and shining; leaf-scars very conspicuous; leaves finely tapered, stiff, glaucous, with numerous marginal and scattered dorsal prickles, average size about 2.3 m. long, 8 cm. broad; fruit-heads pendulous, about 28 cm. long, 20 cm. in diameter; drupes connate in clusters).

Type from New Mecklenburg, Bismarck Archipelago.

The phalanges of *Brass 2837* appear to be a perfect match for Martelli's figures. The leaves are a little broader than those of the original description (described as young) and slightly dilated at the base.

Pandanus novo-hibernicus var. **inermis** var. nov.

A forma typica recedit foliis undique inermibus; syncarpio vix oblongo, subgloboso.

SOLOMON ISLANDS: San Cristoval Island, Waimamura, *Brass 2664,* August 16, 1932, common on banks of streams in rain-forests (tree 10 m. tall, growing in clumps and supported on prickly aërial roots up to 1 m.

long, 5 cm. diameter; stem ringed with leaf-scars, with numerous broad blunt prickles and very short appressed adventitious roots; above each leaf-scar, even on the lower trunks of old trees, is a small dead persistent vegetative bud; leaves in three well defined spirals, smooth, tough, about 2 m. long, 7 cm. wide; inflorescence erect in the early stages, drooping as the fruit grows; fruit-heads about 20 cm. in diameter; drupes connate in bundles. Leaves used in the manufacture of sleeping mats).

The phalanges of this variety can scarcely be distinguished from those of the species; the fruit-head, however, is not so long and the margins, midrib and lateral folds of the leaves are smooth.

Pandanus tectorius Soland. var. **timorensis** Martelli, Webbia **4**(1): 34. 1913, *nomen nudum*, **4**(2): 414, *t. 19, f. 4–5*. 1914, *descr.*

British New Guinea: Western Division, coast between Oriomo and Fly Rivers, *Brass 6407* ♀, *6407A* ♂, March and April, 1936, the common strand species (thickly foliaged tree 4–6 m.; leaves flexible and somewhat glaucous).

Type from the island of Timor; not previously reported from New Guinea.

Here again Martelli's figures are most helpful. The phalanges of this collection are 5.5 cm. long instead of 4 as given in the original description, otherwise they are a good match for the figures. The distinctive characters of this variety appear to be the location of the endocarp in the lower half of the phalange, and the rather shallowly marked and only slightly convex apex of the phalange. The leaf is 1.7 m. long, about 8.5–9 cm. broad at the base tapering gradually to a long caudate apex, the marginal teeth being widely remote on the upper half. The syncarp is ovoid, about 28 cm. long and 20 cm. in diameter.

Brass 1228, which on account of its immature fruit Martelli determined simply as *P. tectorius* forma, seems very much like this material. Likewise the following collection either belongs here or is very closely related: British New Guinea, Western Division, Daru Island, *Brass 6255*, March, 1936, abundant in the substage and conspicuous in the savannah-forests (tree 7–8 m., branching into a flattish spreading open crown; old trees sometimes supported on a compact bunch of stilt-roots ± 20–30 cm. long, stem covered with slender upturned adventitious rootlets; leaves ± 1.5 m. long, 5 cm. broad (across central channel), tapered to a long fine point, few prickles above the basal 30 cm.; fruit-heads solitary on branches, pendent amongst the leaves; drupes green).

Pandanus tectorius Soland. var. **novo-guineensis** Martelli, Webbia **4**(1): 34. 1913, **4**(2): 413, *t. 43, f. 4–5*. 1914.

BRITISH NEW GUINEA: Western Division, Wassi Kussa River, Tarara, *Brass 8648*, January, 1937, poorly drained savannah-forests (mature trees rare, seedling plants very abundant in places; trees 4–5 m. high, supported on a bunch of crowded prop-roots 20–30 cm. long; stem branched into an open crown; leaves somewhat glaucous below; fruit-heads orange-red, ovoid, typically about 18 × 14 cm.).

Type from Northeastern New Guinea.

The phalanges of our material are 5.5 cm. long, 3 cm. broad and 6–8-loculed. The leaves are ± 1.4 m. long and 3–4 cm. broad, gradually tapering from the slightly dilated base to a long caudate apex. Since we have only Martelli's figures as a basis for comparison, this seems to be the best disposition of this collection at present.

Pandanus tectorius Soland. var. **suvaensis** (Martelli) comb. nov.

P. odoratissimus Linn. f. var. *suvaensis* Martelli, Univ. Calif. Publ. Bot. 12: 332, *t. 41*. 1930.

SOLOMON ISLANDS: Bougainville Island, Karngu, Buin, *Kajewski 2299*, October 27, 1930, common close to the seashore (a *Pandanus* up to 10 m. high; leaves up to 2.5 m. long with serrate margin and midrib beneath; fruit a large cone 30 cm. long, 26 cm. in diameter; seeds yellow-green imbedded in a white center, the diameter of which is 8 cm. When ripe, the juice of the fruit is pressed out and drunk by the natives).

Type from the Fiji Islands.

The phalanges of our material so closely match those of the type-collection that they must surely belong to the same entity.

Pandanus upoluensis Martelli, Bishop Mus. Occas. Pap. **10**(13): 15, *t. 6, 7*. 1934.

Pandanus tectorius var. *upoluensis* Martelli in Rechinger, Denkschr. Math.-Nat. Kl. Akad. Wissensch. Wien **85**: 230. 1910, **89**: 489. 1913 (Bot. Zool. Ergeb. Wissensch. Forsch. Reise Samoa- New Guin. Salomon Ins. **3**: 56, *f. 4*. 1910, **5**: 47. 1913), Webbia **4**(1): 35, *t. 17, f. 11–13*. 1913, **4**(2): *t. 18, f. 4–19*. 1914.

SOLOMON ISLANDS: Ulawa Island, *Brass 2994*, October 8, 1932, common on rocky foreshores (stems usually solitary, on a supporting mass of stout prickly stilt-roots; old trees 10 m. or more tall; branches numerous from the upper part of the stem, leaf-scars obscure and prickles blunt; leaves short, crowded, glaucous, very stiff; fruit-heads terminal, on a stiff peduncle, erect or nearly so, 3-angled, about 17 cm. long, 13 cm. in diameter; drupes connate in clusters. Leaves used in the manufacture of plaited arm-bands).

Type from Samoa; previously reported from New Pommerania and the Solomon Islands.

Pandanus Brassii Martelli, Jour. Arnold Arb. **10:** 139, *t. 18, f. A.* 1929; White, op. cit. 202.

British New Guinea: Western Division, Oriomo River, Dagwa, *Brass 5933,* February 15, 1934, commonly scattered over open grass-slopes, also forming large areas of almost pure forest, at 45 m. alt. (tree 4–5 m., freely branched into a spreading compact crown; prop-roots rarely developed, numerous very small upturned appressed adventitious roots on the trunk; syncarps very variable in size, solitary, pseudo-terminal, erect when young, pendent towards the ripening stage; drupes connate in clusters, red when ripe; leaves ± 1.5 m. long, both surfaces glaucous towards the base).

The phalanges differ from those of the type only in being a little smaller and a little younger; the leaf-margins have a few more dentations towards the apex: these are surely not significant differences.

Pandanus pseudopapuanus Martelli, Webbia **4**(1): 28. 1913, **4**(2): 407, *t. 33, f. 1–3.* 1914.

Pandanus papuanus sensu Warburg, Pflanzenr. **3(IV.9):** *f. 13H, J.* 1900; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 160. 1900, non Solms-Laub.

British New Guinea: Western Division, Oriomo River, Wuroi, *Brass 5847,* January 31, 1934, plentiful in riverbank rain-forest; Lake Daviumbu, Middle Fly River, *Brass 7758,* September, 1936, comparatively moist hollows in rain-forest; Palmer River, 2 miles below Black River Junction, *Brass 7071,* June, 1936, scattered in forest substage on low creek-banks, at 100 m. alt.

Type from Northeastern New Guinea.

This is a very tall tree (up to 25 m. or more) with a large spreading crown, leaves gradually acuminate, ± 2.5 m. long, 8–10 cm. broad, and solitary, pendent oblong-ovoid fruit-heads 30–35 cm. long and 15–21 cm. in diameter.

Pandanus Solms-Laubachii F. Muell. Bot. Zeit. **45:** 218. 1887, Second Cens. Austral. Pl. **1:** 202. 1889; Warburg, Pflanzenr. **3(IV.9):** 46, *f. 13, G.* 1900; F. M. Bailey, Queensl. Fl. **5:** 1689. 1902, Comprehens. Cat. Queensl. Pl. 576. 1913; Martelli, Webbia **4:** 31, *t. 5, f. 5–6.* 1913.

British New Guinea: Lake Daviumbu, Middle Fly River, *Brass 7931,* September, 1936, scattered over wet grass plains (tree 5–7 m. high, freely branched into an open crown and supported on a few short crowded prop-roots; stem and branches gray, more or less covered with short upturned adventitious roots; leaves somewhat glaucous; fruit-heads

bluntly ovate, up to ± 20 cm. long, 15 cm. diameter; ripe syncarps orange-red).

The phalanges of this collection are so very much like those of *Amundsen*, November, 1924, Mourilyan, North Queensland, and *White 3330*, cult. Botanic Gardens, Brisbane, that we have little hesitation in assigning it (*Brass 7931*) to this Australian species. *Pandanus Solms-Laubachii* was questionably reported from New Guinea by Warburg, l. c. The distinctive characters are the lateral stigmas, the flattened apices and the sulcate sides of the drupes, and the ± fuscous teeth of the margins of the leaves.

Pandanus Kajewskii sp. nov. § *Keura*. Pl. II, f. 3.

Arbor usque ad 8 m. alta. Foliis 7.5 m. latis, subtus longitudinaliter venosis; margine remotiuscule denta'a, dentibus brevibus, acutis; costa media remote denticulata. Syncarpio 27 cm. longo, 21 cm. diametro; phalangibus 10 cm. longis, 3.5–4.5 cm. latis, in tertia parte superiore liberis, basi angustatis (1.5 cm. latis), angulatis, ibique inter se divaricatis, lateribus latis subplanisque; loculis 10–16, apice pyramidatis, sulcis profundis separatis, vertice parvo obliquo terminatis; stigmate subverticali, omnibus centroscopicis; endocarpio ligneo vel osseo in parte mediana posito, superne irregulariter sinuoso vel lobato; mesocarpio supero medulloso-fibroso.

Solomon Islands: Bougainville Island, *Kajewski 1757*, April 23, 1930, Kupei gold field, common in rain-forest, at 1000 m. alt. (a Pandanus up to 8 m. high with large typically cone-shaped fruits 27 cm. long and 21 cm. in diameter).

Since the leaf of the specimen at hand is only 1.8 m. long, and 6 cm. broad at the broken end, with its greatest width around 7 cm., it is probably safe to assume that the leaves are around 3 m. long. The widely spreading, large and free apices of the phalanges are the distinguishing characters of this species. The sides are smooth and angular, the top is divided into a group of 10–16 pyramids about 1 cm. long. The stigmas are lateral and face toward the center of the phalange.

Section Hombronia

Pandanus tetrodon (Gaudich.) Balfour f. Jour. Linn. Soc. **17:** 63. 1878; Kanehira, Bot. Mag. Tokyo **52:** 236, *f. 70*. 1938.

Barrotia tetrodon Gaudich. Bot. Voy. Bonite *t. 13, f. 1–8*. 1842.
Hombronia edulis Gaudich. op. cit. *t. 22, f. 17*. 1842.
Barrottia Gaudichaudii Brongn. Ann. Soc. Nat. Ser. VI. **1:** 264. 1875, *nomen nudum*.

Pandanus Hombronia F. Muell. Victoria Nat. 143. 1890 (repr. Bot. Centralbl. **45**: 123. 1891).

Pandanus compressus Martelli, Webbia **1**: 363. 1905, **4**: 10, *t. 8, f. 14–15.* 1913.

Pandanus Yamagutii Kanehira, Bot. Mag. Tokyo **50**: 544, *f. 54.* 1936.

Solomon Islands: San Cristoval Island, Waimamura, *Brass 2786,* September 1, 1932, common on raised coral foreshore. Also observed on Ulawa Island (tree up to 15 m. tall with shortly spreading branches usually in whorls of three. Trunk supported on a few very stout aërial roots armed with scattered short broad-based prickles. Leaves very pale, the upper part twisted at right angles with the base. Those of an adult tree about 1.5 cm. long, 15 cm. broad. Fruit-heads very glaucous, globose, terminating the branches, pendent on a three-angled bent peduncle 50–60 cm. long. Drupes free, 4–6-angled, very large).

This specimen seems unquestionably to represent *P. tetrodon* (Gaudich.) Balfour f. as recently and correctly interpreted by Kanehira. The phalanges (immature), although only about the size of those in Kanehira's figures, correspond in all details to this species.

Pandanus hystrix Martelli, Bull. Soc. Bot. Ital. **1904**: 300. 1904, Webbia **4**(1): 16, *t. 14, f. 1.* 1913.

British New Guinea: Palmer River, two miles below Black River Junction, at 100 m. alt., *Brass 7007,* June, 1936, a forest substage species of the higher riverbanks and damp hollows between ridges (stilt-roots enormously developed, cylindric, widely spread and supporting the short branched stem in a reclining position 12–14 m. above the ground; stem and stilt-roots armed with scattered short thorns; leaves pliant, glaucous below, 1.2–1.4 m. long, 6–6.5 cm. broad on fruiting branches; fruit-heads solitary, pendent, ovoid-globose, on an average specimen 26 cm. long, 21 cm. in diameter; exposed portion of syncarps glaucous green, lower parts pink; inflorescence of staminate trees pendent below the branches, 80–100 cm. long; bracts soft, white, concave, with keeled apex).

Type collected by *D'Albertis,* Fly River.

Although Martelli's description is very brief, it seems as if *P. hystrix* is the entity to which *Brass 7007* belongs. The syncarp is composed of obovate-cuneate and for the most part strongly compressed phalanges arranged in vertical rows. These phalanges are free in the upper fourth part and granular. The locules of the lateral ones are mostly 2-seriate (occasionally 1-seriate as in the type), but those of the apical phalanges are in irregular groups as in section *Keura.* The stigmas are chiefly horizontally depressed. The endocarp is approximately in the middle of the phalange; the upper mesocarp is medullose-fibrous with rather

coarse fibres. The leaves are scarcely dilated at the base, acute at the apex, and have the margins and the midrib beneath clothed with close and finely aculeiform teeth.

The staminate inflorescence is a branching spadix, each branch being subtended by a broadly ovate spathe (7–25 cm. or more long), and bearing numerous (sometimes branching) columns or branchlets. At the ultimate tips of these the stamens are borne in an irregularly palmate or digitate manner. The anthers are ± 2 mm. long, oblong-ovate and submuticous.

Pandanus Balenii Martelli, Webbia **2**: 432. 1907, **4**(1): 7. 1913, **4**(2): *t. 21, f. 1–5*. 1914; White, Proc. Roy. Soc. Queensl. **34**: 14. 1923.

BRITISH NEW GUINEA: Central Division, Dieni, Ononge Road, *Brass 3948, 3955*, May, 1933, fairly common in rain-forest, at 500 m. alt.

Type from Dutch New Guinea.

The phalanges of *Brass 3955* (those of *Brass 3948* are immature) so closely coincide with Martelli's figures of *P. Balenii* that it does not seem as if they could belong to any other species. However, it is essential to add that our collections show some variation from the original description. Brass's field-notes indicate a plant with unbranched stem less than 10 cm. long, leaves up to 2.65 m. long, 7.4–8.5 cm. wide, and a syncarp 17 cm. long, 12 cm. diameter, dark purple-brown outside, bright scarlet within.

Pandanus limbatus sp. nov. § *Hombronia*. Pl. II, f. 5.

Caulis 1.5–2 m. longus, 6–7 cm. diametro, non ramosus. Foliis circiter 1.7 m. longis, ± 7 cm. latis, versus basin paullo angustioribus, ad basin paullo dilatatis, apice concavis; in pagina inferiore, basi excepta, longitudinaliter venulosa; costa media subtus prominente, in parte apicali breviter subdistanterque serrata; margine remotiuscule subserrato; plicis lateralibus apicem versus remote serrulatis. Syncarpio pseudo-terminali, pendulo, globoso, 12.5 cm. diametro; phalangibus drupis 2–4 inter se in unica serie transversali coalitis compositis, numerosis, in parte inferiore connatis, cuneato-complanatis, 4.5–5 cm. longis, 2.5–3(–4) cm. latis, 7–9 mm. crassis; phalangium pileo e pileis partialibus druparum composito; pileis 1.5–1.7 cm. longis, pyramidatis, tetra – pentagonis, apice truncatis; stigmate verticali ad latus pyramidale sito, latiuscule oblongo; endocarpio osseo, partem mediam transverse repletente; mesocarpio supero fibroso.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass 7228* (TYPE), July, 1936, occasional on banks of small streams in the ridge-forests, at 100 m. alt. (stem 1.5–2 m. long, 6–7 cm.

diameter, unbranched and without stilt roots; leaves concave towards the apex; fruit-head pseudo-terminal, pendent amongst the leaves; drupes syncarpous, apex purple-green, basal parts red).

This species is very much like *P. Balenii* Martelli, differing in its much longer stem, globose syncarp, and longer pyramidal drupe-heads. The latter appear to slope gradually toward the apex rather than being rounded in the lower part and more abruptly narrowing towards the apex.

Section Bryantia

Pandanus nemoralis sp. nov. § *Bryantia.* Pl. I, f. 15.

Planta gracilis, 3–4 m. alta. Foliis chartaceis, glaucis, ± 65 cm. longis, in dimidio superiore ± tessellatis, planis, 5.5–7 cm. latis, in dimidio inferiore ± plicatis, sensim angustis, 4 cm. latis, ad basin paullo dilatatis, apice abrupte acuminato-caudatis, cauda ± 4 cm. longa, margine versus basin denticulato-serrato, sursum inermi versus apicem serrato; plicis lateralibus inermibus; costa media acuta, versus apicem sparse serrata. Inflorescentia terminali; syncarpiis circiter 12, spicatim dispositis, quoque syncarpio spatha propria; spathis inferioribus foliaceis, ± 32 cm. longis, ± 5 cm. latis, acuminato-caudatis, superioribus multo minoribus, breviter acuminatis vel acutis. Syncarpio infero 5 cm. longo, 5 cm. lato, 2 cm. crasso, subpatelliformi, supero multo minore; drupis 8–10 mm. longis, 5 mm. et ultra latis, oblongis, obtuse angulosis, pileo convexo, pseudo-costato, vertice depresso, stigmate in disco explanato, 2–2.5 mm. lato, centrali vel subexcentrico; mesocarpio supero concavo, 1 mm. et ultra longo, loculis 1–2, endocarpio 3.5 mm. longo; mesocarpio infero concavo.

Solomon Islands: Florida Islands (N'Gela), Olevuga Island, *Brass 3489* (type), January 16, 1933; Ysabel Island, Tasia, *Brass 3279,* December 5, 1932, common in lowland rain-forests (very slender erect stilt-rooted tree 3–4 m. tall; stems not exceeding 5 cm. in diameter; leaves soft in texture, crinkled and much recurved, somewhat glaucous on both sides toward the base; inflorescence terminal; bracts persistent).

The thin leaves narrowed toward the base and unarmed except close to the base and the apex, and the broad suborbicular stigmatic disk are the distinguishing characters of this species. In drying, the ends of the fibres of the upper mesocarp cause the shrunken pericarp to appear somewhat ribbed or striate. The syncarp is somewhat patelliform; the receptacle is much flattened so that each syncarp fits the axis of the inflorescence very compactly. The flattened syncarp is also found in *P. dinagatensis* Merr. and *P. paloensis* Elmer, but *P. nemoralis* is readily separated from these by the characters enumerated above.

Pandanus Rechingeri Martelli, Denkschr. Math.-Naturwissensch. Kl. Akad. Wissensch. Wien **89**: 489. 1913 (Bot. Zool. Ergeb. Wissensch. Forsch. Reise Samoa- New Guin. Salomon Ins. **5**: 47. 1913), Webbia **4**(1): 29. 1913, *nom. nud.*, **4**(2): 425, *t. 27, f. 5.* 1914, *descr.*

SOLOMON ISLANDS: Guadalcanal, Berande, *Brass 2552*, July 23, 1932, an estuarine species; Ulawa Island, *Brass 2942*, October 4, 1932, common in a small swamp; Ysabel Island, Tasia, *Brass 3275*, December 5, 1932, common in rain-forests fringing the coast; Meringe, *Brass 3175*, November 22, 1932, rocky foreshores.

Brass's field-notes indicate a tree 2–7 m. high, supported on stilt-roots; leaves very numerous, 2–2.5 m. long, spreading and drooping; ♀ inflorescence on short divaricate lateral leafy branches (in *Brass 3275* a terminal pendent raceme); ♂ inflorescence inclosed in white (or with green tips) bracts. There is considerable variation in the width of the leaf, depending on whether it is part of the leafy lateral branch bearing the infructescence or whether it is on the vegetative part of the plant. The staminate spikes are dense, the stamens racemose on the very short (3–4 mm. long) columns or branchlets. The filaments are exceedingly short (0.3 mm. long) and the oblong obtuse anthers are about 1.5 mm. long.

Martelli has already pointed out how very closely this species resembles *P. polycephalus* Lam. The latter has narrower drupes with more nearly pyramidal free apices.

In Webbia Martelli does not mention the earliest publication of the name *Pandanus Rechingeri*. Probably he had anticipated that his treatment in Webbia would be published earlier; the name is listed only in Webbia **4**(1), with a reference to the description in **4**(2), dated 1914.

Pandanus exiguus sp. nov. § *Bryantia* Pl. I, f. 14.

Planta vix 2 m. alta; trunco non ramoso, sparse aculeato, in dimidio superiore folioso; foliis inflorescentiam proximis angustis, 70–76 cm. longis, 1.2–1.4 cm. latis, apice sensim attenuatis, basi dilatatis, amplexicaulibus, margine in parte basilari nudo, sursum remotiuscule dentato-serrato, supra plicis lateralibus versus apicem irregulariter sparseque denticulatis, subtus costa media acuta, remote denticulata. Spathis ± 12 cm. longis, ovato-lanceolatis, navicularibus, margine costaque media breviter dentato-serratis. Syncarpio solitario, erecto, oblongo, 6–7 cm. longo, 3–3.5 cm. diametro, pedunculato; pedunculo brevi; drupis coccineis, circiter 13 mm. longis, 4 mm. latis, irregulariter pentagonis, prismaticis, cuneato-oblongis, numerosis, in dimidio inferiore connatis, apice breviter lateque pyramidatis, angulatis; stylo brevissimo, discum stig-

matiferum subrotundum vel hippocrepiforme gerente; endocarpio osseo, 3 mm. longum, mesocarpium supero cavo, 4 mm. longo, infero fibroso.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass 7070* (TYPE), June, 1936, abundant in forest undergrowth round the edges of a swampy depression and extending to the surrounding low ridges, at 100 m. alt. (plant less than 2 m. high, stem unbranched, raised on stilt-roots 20–30 cm. long, the upper half leafy; a few upturned prickles on the stem and stilt-roots; fruit-head erect amongst the leaves, 6–7 cm. long, 3–3.5 cm. diameter; drupes red).

The pericarp contains a reddish dye which colors paper in contact with the broken surface of the drupes.

Pandanus leiophyllus Martelli, Webbia, **4**(1): 21, *t. 17, f. 6–10.* 1913, **4**(2): 422. 1914.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass 7636,* plentiful in rain-forests; Lower Fly River, east bank opposite Sturt Island, *Brass 8052,* rain-forest, common on river-banks inundated by spring tides, occasional on drier ground, *Brass 8208* (♂); Western Division, Upper Wassi Kussa River (left branch), *Brass 8617,* rain-forests, restricted to river-banks.

The above collections appear to fit Martelli's description and figures 6, 7, and 10; at the same time it should be noted that none of the specimens at hand have the horn-like lateral processes shown in figures 8 and 9. Mr. Brass's field-notes show this to be a tree 7–12 m. tall with short branches scattered up the stem, not forming a crown as in most species; the leaves are arranged in very definite spirals and leave conspicuous leaf-scars on the branches; the fruit-heads are solitary, semi-erect amongst the leaves, and completely enclosed in dry bracts which rupture about the middle when the fruit is ripe; the drupes are soft, fleshy, and red (when ripe) with a hard yellow apical covering. The syncarps are almost globose.

The staminate inflorescence is a branching spadix, each branch being subtended by a concave narrowly ovate spathe. The outer spathe is 22 cm. long, 8 cm. broad, with margins and midrib spinulose-dentate, the apex caudate; the inner is about 12 cm. long and acutish. Each branch is fairly compact with staminiferous branchlets or columns ± 1 cm. long, the short filaments (0.2–0.4 mm.) bearing abruptly caudate anthers (± 2 mm. long).

Pandanus meniscostigma sp. nov. § *Bryantia.* Pl. II, f. 2.

Planta parva, usque ad 5 m. alta, saepe non ramosa; trunco laevi, pallide brunneo, sparse aculeato, aculeis circiter 2 cm. longis. Foliis

(nonnumquam in trunco inferiore persistentibus) 2.4–2.8 m. longis, 4.5 cm. latis, apice sensim acuminato-caudatis, basi paullo dilatatis, margine acute dentato-serrato; plicis lateralibus versus apicem irregulariter sparseque dentatis; costa media acuta in dimidio superiore denticulata. Syncarpio oblongo-ovoideo, solitario, maturitate usque ad 35 cm. longo, versus basin 8 cm. diametro, sursum versus apicem 6 cm. diametro; drupis (immaturis) 1.5 cm. longis, numerosis, connatis, oblongis, basi latiusculis; pileo apicali libero, 5 mm. longo, ± hexagono, pyramidato-subrotundato, in vertice explanato; stigmate lato (0.5 mm.), hippocrepiformi, plano; mesocarpio fibroso, endocarpio osseo, in parte infera drupae sito.

BRITISH NEW GUINEA: Central Division, Laloki River, Rona, *Brass 3650* (TYPE), April, 1933, at 450 m. alt., common in rain-forests (slender, often unbranched tree, up to 5 m. tall, supported on a close mass of thick prop-roots 20–30 cm. long. Stem smooth, pale brown, armed with scattered prickles about 2 cm. long. A number of tattered old leaves often persistent on the lower stem. Leaves glaucous beneath, 2.4–2.8 m. long, about 4.5 cm. wide on unbranched trees, much shorter when the tree is branched. Fruit-head, up to 35 cm. long, 8 cm. in diameter near the base, tapering to 6 cm. diameter at 4 cm. from the apex, solitary, lateral amongst the leaves, drooping as the fruit ripens; drupes orange-brown when ripe).

This species suggests *P. leiophyllus* Martelli in the caudate leaf-tips as well as in the distinctive apical portion of the drupes. The latter, however, are more pyramidal in *P. meniscostigma* and the apex is merely a flattened surface marked by the hippocrepiform or crescent shaped stigmatic surface; whereas, in *P. leiophyllus* Martelli, the apex is somewhat depressed and constricted immediately below the broad stigmatic disk, the upper surface of which closely resembles that of our species.

Pandanus paludosus sp. nov. § *Bryantia*. Pl. I, f. 16.

Planta 5–7 m. alta, trunco ramoso. Foliis (in specimine viso) 70–85 cm. longis, medio circiter 6 cm. latis, deorsum ad basin dilatatum sensim angustis, apice acutis, chartaceis, margine minute adpresseque denticulato; costa media prominula, in parte superiore adpresse denticulato-serrata; plicis lateralibus versus apicem parce minuteque denticulato-serratis. Syncarpio solitario, fere erecto vel erecto, ovoideo, 10 cm. longo, 7–8 cm. diametro, pedunculato (pedunculo trigono usque ad 10 cm. longo) spathis chartaceis imbricatis induto; drupis numerosissimis, adpressis, confertis vel subconnatis, prismatico-clavatis, irregulariter penta-hexagonis, 6 cm. longis, 4–5 mm. latis, basi acutis, apice pileatis, pileo

breviter pyramidato, anguloso; stylo brevissimo, apice in discum latum (2–2.5 mm.) stigmatiferum subrotundum vel subhippocrepiformem explanato; endocarpio cuneato-oblongo, 13 mm. longo; mesocarpio supero cavo, 9 mm. longo, infero fibroso, 8 mm. longo.

SOLOMON ISLANDS: Ysabel Island, Garona, *Brass 3375* (TYPE), December 22, 1932, common in swampy lowland rain-forests (erect tree 5–7 m. tall; stem much branched, supported on prop-roots; a few very small blunt prickles on prop-roots, stem and branches; leaves numerous, down-curved; inflorescence lateral amongst the leaves, erect or almost so; drupes whitish, at least in the growing stage; bracts green).

Pandanus buinensis sp. nov. § *Bryantia*. Pl. II, f. 6.

Planta usque ad 7 m. alta. Foliis (in specimine imperfectis, ad apicem fractis) chartaceo-coriaceis, circiter 1 m. longis, 6–6.5 cm. latis, basi breviter dilatatis, ibique inermibus et amplectentibus, margine in parte superiore minutissime serrato, deorsum dentato-serrato; costa media subtus prominula, in parte superiore minutissime serrata, deorsum remote inconspicueque dentata. Syncarpio solitario, breviter elliptico, 16 cm. longo, 14 cm. diametro, pedunculato; spathis imbricatis, exterioribus 25 cm. longis, interioribus 18 cm. longis, navicularibus; drupis numerosissimis, connatis, linearibus, pentagonis, prismaticis versus basin ± attenuatis, 4 cm. longis, 2–3 mm. latis, pileo apicali circiter 6 mm. longo, libero, pyramidato; stylo brevissimo; stigmate 2–3 mm. lato, apicali vel subexcentrico, in margine irregulariter crenato-sinuato explanato; mesocarpio supero 1.7–1.8 cm. longo, medulloso, infero fibroso; endocarpio tenui, infra medium drupae sito, 11 mm. longo.

SOLOMON ISLANDS: Bougainville Island, Karngu, Buin, *Kajewski 2303* (TYPE), October 30, 1930 (a common *Pandanus* growing up to 7 m. high in the shade of the primeval rain-forest; leaves about 1 m. long, the sheath (where it joins the stem) light-green suffused with pink. Drupes cream-colored with dark brown stigmas).

The general structure of the drupes is similar to that found in the fruit of *P. leptocarpus* Martelli, but the apices in the two are strikingly different. That in our species suggests some likeness to that of *P. discostigma* Martelli, but the stigmatic disk in the latter is much broader in proportion to the size of the drupe.

Pandanus subumbellatus Solms-Laubach, Ann. Jard. Bot. Buitenz. **3:** 96, *t. 16, f. 4–6.* 1883, Bot. Jahrb. **9:** 192. 1888, in K. Schum. & Hollrung, Fl. Kaiser Wilhelms Land 17. 1889; Warburg, Pflanzenr. **3(IV.9):** 69. 1900; Martelli, Webbia **4**(1)**:** 32. 1913, **4**(2)**:** *t. 26, f. 6–11.* 1914.

NORTHEAST NEW GUINEA: Morobe District, Kulunghipi, *Clemens 6638,* June 7, 1937, at ± 1600 m. alt.; Yoangen, *Clemens 6593,* June, 1937, at 1250 m. alt.

These are immature specimens which seem more nearly to fit the description of this species than any other.

Pandanus Cominsii Hemsl. in Hook. Icon. **27:** *t. 2654.* 1900; Martelli, Bot. Jahrb. **49:** 66. 1912, Webbia **4**(1): 10. 1913, **4**(2): *t. 26, f. 20.* 1914, Jour. Arnold Arb. **12:** 269. 1931, **13:** 114. 1932; Kanehira, Bot. Mag. Tokyo **49:** 356, *f. 31.* 1935, Enum. Micr. Pl. 260. 1935, Bot. Mag. Tokyo **50:** 544. 1936.

SOLOMON ISLANDS: San Cristoval Island, Waimamura, *Brass 2600,* common in coastal rain-forests (in clumps about 8 m. high; stems slender, branched near the top, supported on numerous stout prickly prop-roots; leaves numerous, averaging about 1.65 m. × 7 cm., those of young trees much larger; leaf deeply grooved at base, the edges of the groove soon forming two prominent ridges which extend to the apex; fruit surrounded by a number of leafy bracts, the inner closely investing the fruit, solitary at the ends of the branches, 3-angled, 40–50 cm. long, about 8 cm. diameter; drupes free, red, on a bright yellow receptacle).

New Hebrides, Bismarck Archipelago, Caroline Islands.

This specimen is a good match for *Kajewski 471* (named by Martelli) from the New Hebrides.

Pandanus Hollrungii Warburg, Pflanzenr. **3(IV.9):** 71. 1900; Martelli, Bot. Jahrb. **49:** 66. 1912, Webbia **4**(1): 16. 1913, **4**(2): *t. 26, f. 21.* 1914.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass 7118,* June, 1936, apparently restricted to poorly drained soil on flat ridge-tops, at 100 m. alt. (small species 4–5 m. high; stem 6–8 cm. thick, supported on a few prop-roots ± 30 cm. in length, and producing 2 or 3 leafy branches; leaves long and slender, ± 2.5 m. × 4.5 cm., deeply channeled, glaucous underneath; fruit-heads solitary, semi-erect among the leaves, 3-angled, cylindric, ± 24 cm. long, 7 cm. diameter; drupes red).

As regards the recent reduction (Kanehira, Bot. Mag. Tokyo **50:** 544. 1936) of *P. Hollrungii* Warb. and f. *caroliniana* Martelli to *P. Cominsii* Hemsl., we also have no authentic material for comparison. Probably forma *caroliniana* is a different entity from the species, hence it need not be considered here. We agree with Warburg that *P. Hollrungii* strongly suggests *P. Cominsii* Solms-Laub. but differs in the apices of the drupes. In *P. Hollrungii* the apical cap is convex, the stigmatic disk practically

sessile at the centre. In *P. Cominsii,* on the other hand, the apical cap is distinctly pyramidal, the stigmatic disk crowning the narrow and shortly drawn out apex.

Pandanus conoideus Lam. Encycl. **1**: 372. 1785 (excl. *β.*); Balfour f. Jour. Linn. Soc. Bot. **17**: 44. 1878; Warburg Pflanzenr. **3(IV.9)**: 69. 1900; Merr. Interpret. Herb. Amboin. 81. 1917.

Pandanus ceramicus Rumph.; Kunth Enum. **3**: 98. 1841; Solms-Laub. Bot. Jahrb. **13**: 257. 1891; Martelli, Webbia **4**(1): 10. 1913, **4**(2): *t. 26, f. 12–16.* 1914.

Bryantia butyrophora Webb in Gaudich. Voy. Bonite, *t. 20.* 1842.

Pandanus butyrophorus Kurz, Jour. As. Soc. Bengal **38**(2): 150. 1869.

British New Guinea: Central Division, Bella Vista, *Brass 5463,* Nov. 8, 1933, at 1450 m. alt.; planted by natives in gullies and ravines close to their gardens (tree 3–5 m. high, branched, raised on a few prickly stilt-roots; stem and branches armed with upturned prickles; leaves of mature trees always much damaged by insects; syncarp somewhat triangular in cross section, an average specimen measuring 42 cm. long, 10.5 cm. diameter; drupes red on an orange-red receptacle). Northeast New Guinea: Sattelberg, *Clemens 445,* October 14, 1935, hill jungle, at ± 900 m. alt.

Although we have no material with which to compare this specimen, the drupes are a good match for Martelli's figures of this species.

Pandanus Jiulianettii Martelli, Webbia **2**: 433. 1907, **4**(1): 18, *t. 14, f. 6–7.* 1913. Pl. II, f. 8.

British New Guinea: Central Division, Bella Vista, *Brass 5461,* November 8, 1933, planted in the forests on clearings made especially for the purpose, at 1500 m. alt. (trees very tall and much branched; supported on thick slightly fluted prop-roots (up to 13–14 m. long) armed with scattered prickles. Specimens from an average large tree about 100 feet high. Leaves (perhaps 3 m. long, 10–11 cm. broad) drooping; apical portion split down the middle from a very early age, underside glaucous. Syncarp pendent on a long peduncle covered with numerous broad tracts, an average specimen 35.5 cm. long, 24.5 cm. diam.; apex of the drupes brown, exposed sides glaucous. This (*Hina*) is one of the two *Pandanus* spp. grown by the natives for the edible seeds. The other species, called *Mondoa,* was past fruiting and could not be collected. The seeds of both are known as *Katora;* those of *Hina* having a flavor somewhat like coconut but somewhat sweeter. The leaves of both species make a very durable house-thatch).

Although the description of this species is very brief owing to the fragmentary condition of the type-drupes, we are convinced that *Brass 5461*

belongs here. The clavate angular drupes are 2.5–2.7 cm. in diameter, free about 2.5 cm. below the convex apex, and terminate mostly with a slightly depressed area, the suborbicular stigmatic disk being excentric and slightly oblique. The species seems to us to belong to the section *Bryantia* rather than to the section *Hombronia*.

Section LOPHOSTIGMA

Pandanus Archboldianus sp. nov. § *Lophostigma*. Pl. I, f. 21.

Planta erecta, 8–10 m. alta; radicibus aereis aculeatis, erectis, 2–2.5 m. altis; trunco in parte terminali ramoso, ramis 2–3, brevissimis, copiose foliosis. Foliis flexilibus, circiter 3 m. longis, ± 11 cm. latis, abrupte acuminatis, subtus in parte superiore longitudinaliter venulosis, in parte inferiore cum venis evanescentibus; plicis lateralibus obtusis; costa media subtus acuta, apicem versus serrulata; margine serrato-dentato, versus basin dentibus brevibus crebrisque, sursum remotiusculis, in parte apicali minutis crebrisque. Syncarpio solitario, pendulo, aurantiaco-roseo, 32 cm. longo, usque ad 21.5 cm. diametro; drupis connatis, numerosissimis, 6 cm. longis, basi 3–5 mm. latis, in parte apicali libera ± breviter pyramidatis, 2.5–3 mm. longis, compresse penta – hexagonis; stylo in vertice plano, in acumen breve lateraleque producto; stigmate laterali infra acumen styli; endocarpio fere ad basin drupae sito, osseo, circiter 16 mm. longo; mesocarpio fibroso.

BRITISH NEW GUINEA: Central Division, Mafalu, *Brass 5366* (TYPE), Oct. 24, 1933, mountain crest forest, at 1700 m. alt. (erect, 8–10 m. high; trunk supported on a few, almost erect, prickly prop-roots 2–2.5 m. high. Small crown of 2 or 3 very short branches completely covered with broad flexible leaves about 3 m. long; solitary large pendent orange-pink syncarp, 32 cm. long with a maximum diameter of 21.5 cm.; bracts broad).

Pandanus aggregatus sp. nov. § *Lophostigma*. Pl. I, f. 13.

Plantae gregariae, 12–14 m. altae; trunco radicibus aereis aculeatis suffulto, aculeis brevibus, obtusis. Foliis ± 3 m. longis, 7.5–8.5 cm. latis, sensim acuminatis, subtus in parte superiore longitudinaliter minuteque venosis, in parte inferiore cum venis evanescentibus; plicis lateralibus inconspicuis; costa media subtus ad basin ± obtusa inconspicuaque, sursum dentato-serrulata; margine dentato-serrato, dentibus in parte basilari subpatulis, sursum ascendentibus, brevibus, acutis, apice rufescentibus. Syncarpio solitario, pendulo, ovoideo, (in specimine viso) 30 cm. longo, 21 cm. diametro; drupis confertis, linearibus, prismaticis, penta – hexagonis, ± 5.5 cm. longis, 6–8 mm. latis, deorsum paullo

angustioribus, in parte libera convexo-pyramidatis, apice plano vel paullo depresso et in stylum breve lateraliter producto, stigmate bilobo, laterali, transverso; endocarpio fere ad basin drupae sito, osseo, 11 mm. longo, mesocarpio fibroso.

British New Guinea: Palmer River, 2 miles below Black River Junction, *Brass 6974* (type), June, 1936, abundant in substage layer of riverine forests, at 100 m. alt. (forms clumps 12–14 m. tall, comprised of several trees rising from a small compact group of erect prop-roots armed with scattered short blunt prickles; stem branched or unbranched; leaves ± 3 m. long, glaucous underneath, especially towards the base; fruit-heads pendent, solitary amongst the leaves, ovate (collected specimen 30 × 21 cm.); drupes purple at the apex, the lower fleshy parts scarlet; a remarkable rosette effect is produced by the drupes which ripen, a few at a time, and assume an erect position on the receptacle before they fall to the ground).

This species closely resembles *P. Archboldianus*. It differs, however, both in fruit- and foliar characters. The drupes, although very closely appressed, are not so strictly connate, and the free apex is a little longer than in the latter species. The leaves are relatively narrow and taper gradually to an acuminate apex; the margin and the upper midrib are strongly serrate-dentate. In *P. Archboldianus*, on the other hand, the leaves are relatively broad and taper abruptly to an acuminate tip, the marginal serrations (above the basal portion) are remote and more closely appressed.

Pandanus microdontus sp. nov. § *Lophostigma*. Pl. I, f. 18.

Planta 3–4 m. alta, non ramosa. Foliis ± 3 m. longis, 7.5–8.5 cm. latis, basi paullo dilatatis, apice sensim attenuatis; plicis lateralibus vulgo nudis; costa media subtus acuta, in parte superiore denticulato, dentibus suberectis, deorsum nuda; margine serrato-denticulato, dentibus acutis, subulatis. Syncarpio ± 25 cm. longo, 8–8.5 cm. diametro, oblongo; spathis plurimis, confertis, navicularibus; drupis roseis, dense adpressis, numerosissimis, fere linearibus, ± prismaticis, penta – hexagonis, ± 2 cm. longis, 4 mm. latis, apice breviter pileatis; pileo 3 mm. longo subfacile secedente, obtuse angulato, subconcavo cum areola centrali paullo elevata vel subconcava; stylo subexcentrico horizontali vel adscendente, dentiformi vel flabelliformi; stigmate laterali; endocarpio 7 mm. longo, osseo, oblongo, sursum subconico; mesocarpio fibroso, supero 5–7 mm. longo.

British New Guinea: Lake Daviumbu, Middle Fly River, *Brass 7695* (type), September, 1936, occasional in rain-forests (stem unbranched, 3–4 m. long, supported on a few erect, crowded stilt-roots

20–30 cm. in length; fruit-heads pseudo-terminal, ± 24 cm. long, 8.5 cm. diameter; drupes pink).

This species closely approaches *P. Kivi* Martelli in the character of the drupes; but, in *P. microdontus* both the syncarp and the drupes are larger. The leaves also are much longer and broader.

Pandanus Kivi Martelli, Jour. Arnold Arb. **10:** 140. 1929; White, op. cit. 202.

BRITISH NEW GUINEA: Central Division, Kubuna, *Brass 5655,* ridge rain-forests, 100 m. alt. (very slender; top branched into an open crown of very narrow leaves; trunk raised on a few prop-roots, both armed with scattered upturned prickles; syncarps pendent, solitary at the tips of branches, about 20 cm. long; drupes pale yellow).

Owing to our scanty representation of this species, for the present we are maintaining both *P. Kivi* Martelli and *P. Krauelianus* K. Schum. Both are characterized by pendent solitary syncarps 20–25 cm. long, with yellow drupes, and leaves similar in size and in contour. In *P. Kivi,* however, the leaf-margins are dentate at the base, becoming remotely appressed-serrate upward and closely serrate towards the apex; the free apex of the drupe is only slightly convex and the areola subdepressed. In *P. Krauelianus,* on the other hand, the leaf-serrations are not particularly appressed and perhaps a little more evenly distributed up the margin; the free apex of the drupe is distinctly convex and the upper surface of the slightly elevated areola is usually depressed.

Pandanus Krauelianus K. Schum. in K. Schum. & Hollrung, Fl. Kaiser Wilhelms Land 17. 1889; Warburg, Pflanzenr. **3(IV.9):** 72. 1900; Martelli, Bot. Jahrb. **49:** 67. 1912, Webbia **4**(1): 19. 1913, **4**(2): *t. 28, f. 4–6.* 1914.

P. Beccarii sensu K. Schum. Bot. Jahrb. **9:** 192. 1888, non Solms-Laub.
P. flabellistigma Martelli, Webbia **1:** 366 (excl. descr. fol.). 1905, **4**(1): 14. 1913, **4**(2): *t. 28, f. 7–10.* 1914 (fide Martelli).

BRITISH NEW GUINEA: Central Division, Dieni, Ononge Road, *Brass 3851,* rain-forests, at 500 m. alt. (tree 8–10 m. high, supported on very thick, fluted, prickly prop-roots, and branched at the top; leaves numerous, spreading and drooping, on an average 1.5 m. long, 5 cm. broad; fruit-heads at length lateral amongst the leaves, closely invested, all but the tip, by numerous stiff dry bracts; when ripe, the pale yellow drupes fall from within the bracts leaving the latter and the receptacle persistent for several seasons; fruit-heads obscurely 3-angled, tapering slightly to a broad base and obtuse apex, ± 30 cm. long, 7.5 cm. diameter; drupes sweet and fleshy); Fly River, 528 Mile Camp, *Brass*

6764, occasional in forest substage on ridges, at 80 m. alt.; Lake Daviumbu, Middle Fly River, *Brass 7518*, common in rain-forest substage on ridges.

It is to be noted that the syncarps at hand show considerable variation in the degree of convexity and flatness characteristic of the apical part of individual drupes. This species (as we interpret it) and *P. Kivi* Martelli are questionably distinct.

Pandanus xanthocarpus sp. nov. § *Lophostigma*. Pl. I, f. 17.

Planta 5–7 m. alta; trunco ramoso. Foliis 1.5–1.7 m. longis, 7.5–8 cm. latis, flexilibus, sensim acuminatis, basi dilatatis, subtus in parte superiore longitudinaliter venulosis, deorsum venis evanescentibus, glaucis; plicis lateralibus nudis vel apicem versus disperse dentatis; costa media supra canaliculata, subtus acuta, in parte superiore remotiuscule serrata, margine versus basin crebre laxiuscule dentato-serratis, dentibus acutis, subulatis, superioribus ascendenti-erectis, inferioribus ascendentibus vel subpatulis. Syncarpio (immaturo) 22 cm. longo, 11 cm. diametro, solitario, pendulo, oblongo-ovoideo; spathis numerosis, confertis, syncarpio longioribus, imbricatis, in plurimis ordinibus dispositis; drupis 3 cm. longis, vix 3 mm. latis, ad basin paullo angustioribus, confertis, linearibus, prismaticis, penta-hexagonis, pileo apicali 3–3.5 mm. longo, obtuse anguloso, subfacile secedente, apice concavo in pyramidem centralem crassam 0.5–0.7 mm. longam abrupte elevato, vertice plano et in stylum brevissimum lateraliter producto; stigmate dentiformi vel bilobo; mesocarpio superiore medulloso-fibroso, endocarpio lignoso, infra medium drupae sito, 13 mm. longo.

British New Guinea: Western Division, Wassi Kussa River, Tumbuke, *Brass 8487* (type), December, 1936, common in rain-forest on a fresh-water creek; Western Division, Oriomo River, Dagwa, *Brass 5942*, Feb. 16, 1934, not uncommon in low timber belts along creeks, at 40 m. alt.

The field-notes on the type-collection indicate a tree 6–7 m. high, the thin prop-roots crowded under the stem and less than 1 m. long; those of *Brass 5942* describe a tree 5–6 m. high without prop-roots, the top composed of a few divaricate branches. The fruits of both are said to be immature and in the second collection the drupes are pale yellow.

The apex of the drupes is very similar to that found in the fruit of *P. cernuifolius* except that in *P. xanthocarpus* the apex is distinctly concave and the central part is not so prominent. Since *P. cernuifolius* is so very immature it is impossible to say how the size of the drupes would compare. In *P. xanthocarpus* the fibres appear to extend directly to the

apex of the drupe rather than inclining toward the central axis as in *P. cernuifolius*. The latter species also has narrower leaves.

Pandanus cernuifolius sp. nov. § *Lophostigma.* Pl. I, f. 20.

Planta 4 m. alta, non ramosa; trunco radicibusque aereis aculeis validis instructis. Foliis patentibus cernuisque, 1.5–1.6 m. longis, 5–5.3 cm. latis, in dimidia parte inferiore plicatis, in parte reliqua planis; plicis lateralibus versus apicem irregulariter serratis; costa media subtus versus basin inerme, angusta, acuta, remotiuscule serrulata, margine serrato-dentata, dentibus versus basin validis patulisque, sursum brevioribus remotiusculisque. Syncarpio (immaturo) 8 cm. longo, 4 cm. diametro, solitario, pendulo; spathis ± 30 cm. longis; drupis (immaturis) 16 mm. longis, versus apicem 3 mm. latis, connatis, prismaticis, ± hexagonis, pileatis; pileo sublibero, ex vix convexo subimpresso, parte centrali 1 mm. elevata, horizontaliter brevissimeque producta; vertice plano; stigmate parvo dentiformique vel paullo lobato, horizontali; mesocarpio supero fibroso.

BRITISH NEW GUINEA: Central Division, Ononge Road, Dieni, *Brass 3916* (TYPE), May 1, 1933, common in rain-forests (but only one tree seen in fruit), at 500 m. alt. (unbranched tree 4 m. tall, supported on a few short prop-roots; diameter of the stem below the leaves 4 cm.; stem and prop-roots armed with scattered stout prickles; leaves spreading and drooping, 1.5–1.6 m. long, 5–5.3 cm. wide; a solitary pseudo-terminal drooping syncarp completely inclosed in leafy dark green bracts; drupes orange-brown with glaucous bloom).

The leaves of this species are very much like those of *P. Krauelianus* K. Schum. and *P. Kivi* Martelli; but, the prominent areola of the apex of the drupes is more like that found in *P. Beccarii* Solms-Laub. than in the other species.

Pandanus Beccarii Solms-Laub. Ann. Jard. Bot. Buitenz. **3**: 97, *t. 16, f. 7–11.* 1883; F. Mueller, Descr. Notes Papuan Pl. **2**: 68. 1890; Warburg, Pflanzenr. **3(IV.9)**: 71. 1900; Martelli, Webbia **4**(1): 7. 1913, **4**(2): *t. 28, f. 20–25.* 1914.

BRITISH NEW GUINEA: Central Division, Mafulu, *Brass 5283,* 1500 m. alt., common in upper forests.

In 1888 K. Schumann reported *P. Beccarii* Solms-Laub. from New Guinea on the basis of *Hollrung 164.* Later he decided that Hollrung's collection represented a distinct species (*P. Krauelianus* K. Schum.).

Our specimens differ from the original description and Martelli's figures in that the leaves are up to 4 m. long, 6–8 cm. wide, not abruptly

acuminate, and the drupes are a little larger (2.6 cm. long, 4–6 cm. broad).

Pandanus floribundus sp. nov. § *Lophostigma.* Pl. I, f. 19.

Plantae gregariae 12–14 m. altae; trunco in parte superiore ramoso. Foliis ± 3 m. longis, 7–8 cm. latis, subtus glaucis, basi dilatatis, apice sensim acuminatis; margine serrato-dentato, dentibus acutis, subulatis, apice rufescentibus, versus basin confertis, sursum laxiusculis; plicis lateralibus inermibus; costa media subtus prominula, in parte superiore serrulata. Syncarpio ± 45 cm. longo, 14 cm. diametro; spathis persistentibus, imbricatis; drupis numerosissimis, dense adpressis, prismaticis, linearibus, 2 cm. longis, 3–5 mm. latis, rubris, apice brevissime pileatis; pileo purpureo-nigro, 1–2.5 mm. longo, obtuse anguloso, areola centrali ± 0.5 mm. elevata; stylo subexcentrico, depresso, ± bilobo; stigmate parvo; endocarpio ± 9 mm. longo, osseo; mesocarpio supero ± 7 mm. longo, fibroso, infero 4–5 mm. longo, fibroso.

British New Guinea: Palmer River, 2 miles below Black River Junction, *Brass 6975* (type), June, 1936, common in substage of riverine forest, at 100 m. alt. (usually 2 or 3 individuals together in clumps 12–14 m. tall, with a few thick fluted stilt-roots 2–3 m. long, erect beneath them; stilt-roots and stem armed with scattered sharp prickles 1.5 cm. in length; stem branched to form a small crown; leaves ± 3 m. long, glaucous underneath; fruit-heads cylindric, ± 45 cm. long, 14 cm. in diameter, inclosed in persistent bracts and pendent amongst the leaves; drupes red, with purple-black apex).

This species strongly suggests *P. Beccarii* Solms-Laub., but the apex of the drupe is much shorter than in the latter species.

Pandanus lamprocephalus sp. nov. § *Lophostigma.* Pl. II, f. 4.

Arbor 5 m. alta, 7 cm. diametro; trunco non ramoso, aculeato, aculeis sparsis, sine ordine. Foliis 2.4 m. longis, 7–8 cm. latis, basi vix dilatatis, aurantiacis; apice contractis concavisque, acutis; margine serrato-dentato, dentibus brevibus, in parte basilari crebris; plicis lateralibus inconspicuis; costa media subtus in parte basilari obtuse et sursum acute carinata, versus apicem adpresse serrato-denticulata. Spadicibus axillaribus; spathis inferioribus aurantiacis, superioribus purpurascentibus; syncarpio late elliptico, 9 cm. longo, 7.5 cm. lato; drupis numerosis, confertis, 2.8–3.2 cm. longis, 1.5 cm. crassis, pyriformibus, obscure pentagonis, sensim deorsum attenuatis, basi 3 mm. crassis; pileo 7–8 mm. longo, tetra – pentagono, margine rotundato, supra abrupte in pyramidem centralem crassam 3 mm. longam elevato; apice ± plano et in stylum nitidum brunneum undulatum oblique producto; stigmate bilobo

vel subdigitato, verticali in latere pyramidali sito; endocarpio osseo, cuneato-oblongo, in parte superiore drupae sito, mesocarpio superiore 3 mm. longo, laxe fibroso, inferiore 15 mm. longo, compacte fibroso.

SOLOMON ISLANDS: San Cristoval Island, Hinuahaoro, *Brass 2878* (TYPE), Sept. 16, 1932, mountain rain-forests, at 900 m. alt. (unbranched tree 5 m. high, supported on a few thick stilt-roots. Stem 7 cm. diameter, faintly leaf-scarred and bearing scattered small prickles; leaves numerous, about 2.4 m. long, 7–8 cm. wide, orange-yellow on both sides at the base, under surface glaucous, midrib very pale, apex contracted and concave; fruit-heads in axils of lower leaves, lower bracts orange-yellow, upper purplish; cone 9 cm. × 7.5 cm., very pale purple-gray, the raised processes brown).

In general outline the drupes somewhat suggest those of *P. ceratostigma* Martelli, but the stigma is unquestionably lateral allying this species with the section *Lophostigma*, rather than with the section *Rykia* (to which *P. ceratostigma* belongs).

Section ACROSTIGMA

Pandanus Odoardi Martelli, Bull. Soc. Bot. Ital. **1904**: 304. 1904, Webbia **4**(1): 25, 1913, **4**(2): *t. 39, f. 6–11.* 1914.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass 7190*, at 100 m. alt. (scattered through sedge undergrowth in swampy parts of the forest. Plant stemless; leaves numerous, ± 180 cm. long, 4.5 cm. broad, very dark above and very glaucous below; peduncle pseudo-terminal, erect, 50–60 cm. long; fruit-head ovoid, scarlet, soft and fleshy, 10.5 cm. long, 7 cm. diam.).

This species was described from the syncarp alone; the above field-note gives a brief word-picture of the habit of the plant.

The fruit-head somewhat suggests that of *P. ihuanus* Martelli, but the free apex of the drupes is much shorter and abruptly constricted at the base of the style in *P. Odoardi*.

Pandanus ihuanus Martelli, Jour. Arnold Arb. **10**: 141. 1929, White, op. cit. 202.

BRITISH NEW GUINEA: Central Division, Ononge Road, Dieni, *Brass 3924*, May 1, 1933, common in rain-forests, at 500 m. alt. (a trunkless species; two or three leaf-shoots forming a clump from a very short woody stock; roots produced from between the lower leaves; fruit-heads globose, 11 cm. long, 11.5 cm. diam.; drupes fleshy).

Pandanus rostellatus sp. nov. § *Acrostigma*. Pl. II, f. 1.

Humilis, caespitosus. Foliis 1.3 m. longis, 2–2.5 cm. latis, linearibus,

tessellatis, plicatis, apice acuminatis; margine serrato-denticulatis; costa media in parte basilari retrorse denticulata, in parte superiore remotiuscule serrata; plicis lateralibus obtusis, versus apicem remote serrulatis. Syncarpio ± globoso, 6 cm. diametro, solitario, erecto; drupis numerosis, 2.8–3 cm. longis, 5 mm. latis, vulgo pentagonis, utrinque attenuatis; pileo 1.2 cm. longo, anguloso, laevi, libero, elongato-pyramidato, apice mucroniformi uncinatoque; stigmate anguste lineari; endocarpio infra medium drupae sito, circiter 7–9 mm. longo, oblongo, supra planotruncato; mesocarpio supero concavo.

BRITISH NEW GUINEA: Central Division, Kubuna, *Brass 5675* (TYPE in Herb. New York Bot. Gard.), December 15, 1933, common forest ground plant, at 100 m. alt. (several leaf-shoots in a clump; erect, solitary syncarp of orange-colored fruit, about 6 cm. in diameter).

The species suggests *P. caricosus* Kurz; but, the latter differs in having a pendulous syncarp and granular-scabrous drupes.

Pandanus Danckelmannianus K. Schum. Fl. Kaiser Wilhelms Land 18. 1889; Warburg, Pflanzenr. **3(IV.9)**: 80, *f. 22, L–M.* 1900; Martelli, Webbia **4**(1): 11. 1913, **4**(*2*): *t. 32, f. 29.* 1914.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass 7861,* September, 1936, common on hillsides in rain-forest (stem 4–6 m. long, seldom branched, without prickles but with numerous upturned rootlets; prop-roots few, short and crowded; leaves to ± 3 m. in length; inflorescence shortly pedunculate in axils of leaves, several to each plant; fruit-heads globose, apparently red when ripe). SOLOMON ISLANDS: Ysabel Island, Tiratona, *Brass 3342,* December 10, 1932, common in mountain rain-forests, at 600 m. alt. (tree up to 10 m. tall, no stilt roots; stem simple or branched near the summit, pale brown, with only very indistinct traces of leaf-scars, unarmed but bearing a few upturned dead-roots about 1 cm. long; fruit-heads several, lateral amongst the leaves, slightly reniform, 20 cm. diameter; drupes scarlet; leaves very numerous, averaging 3.5 cm. long, 12 cm. broad, underside glaucous, the tips bent and pendent).

Type from Northeastern New Guinea; reported also (by Martelli) from the Bismarck Archipelago.

These two collections illustrate both the mature and the immature stages of development of the fruit; in *Brass 7861* the fruit-heads are about 7 cm. in diameter and are attached to a flattened peduncle ± 16 cm. long covered with short obtuse spathes ± 8 cm. long. The staminate spadix at hand is about 40 cm. long, covered with short blunt spathes ± 8 cm. long and concave at the apices. Towards the apex, the

spadix branches into about 5 spikes covered with stamens; the filaments are very short, solitary or clustered in groups of two or three, the anthers are linear, ± 7 cm. long, tipped with a cusp about 2 mm. long. In *Brass 3342,* the drupes are mature and the endocarp is about 1.5 cm. long.

Pandanus stenocarpus Solms-Laub. Ann. Jard. Bot. Buitenz. **3**: 91, *t. 16, f. 1.* 1883; Warburg in Engl. Pflanzenr. **3(IV.9)**: 83, *f. 22D.* 1900; Martelli, Webbia **4**(1): *32.* 1913, **4**(*2*): *t. 32, f. 30.* 1914.

BRITISH NEW GUINEA: Mafalu, Central Division, *Brass 5345,* Oct. *22,* 1933, lower primary forest, at 1250 m. alt. (about 6 m. high; trunk unbranched, supported on prickly stilt-roots; leaves usually about 4 m. long, glaucous beneath; syncarp red, solitary and lateral, irregularly spherical, 20 cm. × 13 cm. × 13 cm., on a short flat peduncle, much of the syncarp concealed amongst the leaves; drupes slender).

Type from Dutch New Guinea.

This species, described by Solms-Laubach in 1883, from a few empty drupes seems to be known in literature only from the original collection. Although our material is somewhat fragmentary, in addition to the information contributed by the field-label, we find that the leaves are 14 cm. broad near the base, about 11 cm. broad near the middle (?), tapering gradually to a long acuminate apex. The dentate margin with teeth 4–5 mm. long towards the base gradually becomes finely and closely serrate towards the apex, but the lateral folds are finely aculeate only towards the apex. Unfortunately the syncarp is not entire, so that we have only ± isolated drupes for study. In these most of the spiny tips are broken off; the endocarp is 1–1.5 cm. long and practically basal. A young inflorescence about 20 cm. long in the axil of an upper leaf consists of imbricate, bluntly acuminate spathes.

Pandanus Lauterbachii K. Schum. & Warburg, Pflanzenr. **3(IV.9)**: 81. 1900; Martelli, Webbia **4**: 21. 1913, Jour. Arnold Arb. **10**: 141. 1929; White, op. cit. 202.

BRITISH NEW GUINEA: Western Division, Oriomo River, Wuroi, *Brass 5791* (♀), *5892* (♂); Fly River, 528 Mile Camp, *Brass 6829* (♀); Sturt Island, Lower Fly River, *Brass 8138* (♂).

Type from Northeastern New Guinea.

The above cited collections compare favorably with *Brass 986* (Lepokera, Vailala River) determined by Martelli. The branching staminate spadix of *P. Lauterbachii* K. Schum. & Warb. as illustrated by *Brass 8138* is about 1 m. long. The broadly lanceolate to narrowly ovate spathes are white and vary from 30 to 15 cm. in length, the smaller being towards the

apex of the spadix. The anthers are 1.5–2 cm. long, linear and abruptly acuminate or cuspidate.

Pandanus setistylus Warburg, Pflanzenr. **3(IV.9):** 81, *f.* 22A C. 1900; Martelli, Webbia **4:** 30. 1913.

Northeastern New Guinea: Morobe District, Sattelberg, *Clemens 355*, edge of jungle, at ± 900 m. alt.

EXPLANATION OF THE PLATES

Plate I

All figures natural size except as otherwise specified.

Fig. 1. *Freycinetia lacta* Merr. & Perry: an immature syncarp (♀) in profile; *a*, a berry.

Fig. 2. *Freycinetia divaricata* Merr. & Perry: two adnate berries; *a*, a seed (natural size, and ×5 linear).

Fig. 3. *Freycinetia polyclada* Merr. & Perry: the tip of a branch with a syncarp; *a*, two berries in profile; *b*, a seed (natural size, and ×5 linear).

Fig. 4. *Freycinetia oreophila* Merr. & Perry: a berry; *a*, a seed (natural size, and ×5 linear).

Fig. 5. *Freycinetia membranacea* Merr. & Perry: two berries; *a*, a seed (natural size, and ×5 linear).

Fig. 6. *Freycinetia nesiotica* Merr. & Perry: a berry; *a*, a seed (natural size, and ×5 linear).

Fig. 7. *Freycinetia salamauensis* Merr. & Perry: a cluster of berries in profile; *a*, the same from above; *b*, a seed (natural size, and ×5 linear).

Fig. 8. *Freycinetia anomala* Merr. & Perry: a berry (very immature); *a*, the same from above.

Fig. 9. *Freycinetia nervosa* Merr. & Perry: a cluster of berries; *a*, a seed (natural size, and ×5 linear).

Fig. 10. *Freycinetia Archboldiana* Merr. & Perry: a cluster of berries (very immature); *a*, the same from above.

Fig. 11. *Freycinetia undulata* Merr. & Perry: a part of a longitudinal section of a syncarp; *a*, a berry (immature).

Fig. 12. *Freycinetia percostata* Merr. & Perry: a cluster of berries; the apex of a berry and a seed (both: natural size, and ×5 linear).

Fig. 13. *Pandanus aggregatus* Merr. & Perry: a cluster of drupes in profile; *a*, the same from above.

Fig. 14. *Pandanus exiguus* Merr. & Perry: a cluster of drupes in profile; *a*, the same from above; *b*, a drupe in longitudinal section.

Fig. 15. *Pandanus nemoralis* Merr. & Perry: a cluster of drupes in profile; *a*, the same from above; *b*, a drupe in longitudinal section.

FIG. 16. *Pandanus paludosus* Merr. & Perry: a cluster of drupes; *a*, the same from above; *b*, a drupe in longitudinal section.

FIG. 17. *Pandanus xanthocarpus* Merr. & Perry: a cluster of drupes in profile; *a*, the same from above.

FIG. 18. *Pandanus microdontus* Merr. & Perry: a cluster of drupes in profile; *a*, the same from above.

FIG. 19. *Pandanus floribundus* Merr. & Perry: a cluster of drupes in profile; *a*, the same from above.

FIG. 20. *Pandanus cermifolius* Merr. & Perry: the apex of a single drupe in profile; *a*, a cluster of drupes from above (immature).

FIG. 21. *Pandanus Archboldianus* Merr. & Perry: a cluster of drupes in profile; *a*, the same from above.

PLATE II

FIG. 1. *Pandanus rostellatus* Merr. & Perry: a cluster of drupes in profile; *a*, the apex of a single drupe: *b*, a drupe in longitudinal section.

FIG. 2. *Pandanus meniscostigma* Merr. & Perry: some drupes in profile; *a*, the same from above.

FIG. 3. *Pandanus Kajewskii* Merr. & Perry: a phalange; *a*, the same in longitudinal section.

FIG. 4. *Pandanus lamprocephalus* Merr. & Perry: a drupe in profile (from two different angles); *a*, the same from above; *b*, a drupe in longitudinal section.

FIG. 5. *Pandanus limbatus* Merr. & Perry: a phalange in profile.

FIG. 6. *Pandanus buinensis* Merr. & Perry: a cluster of drupes in profile.

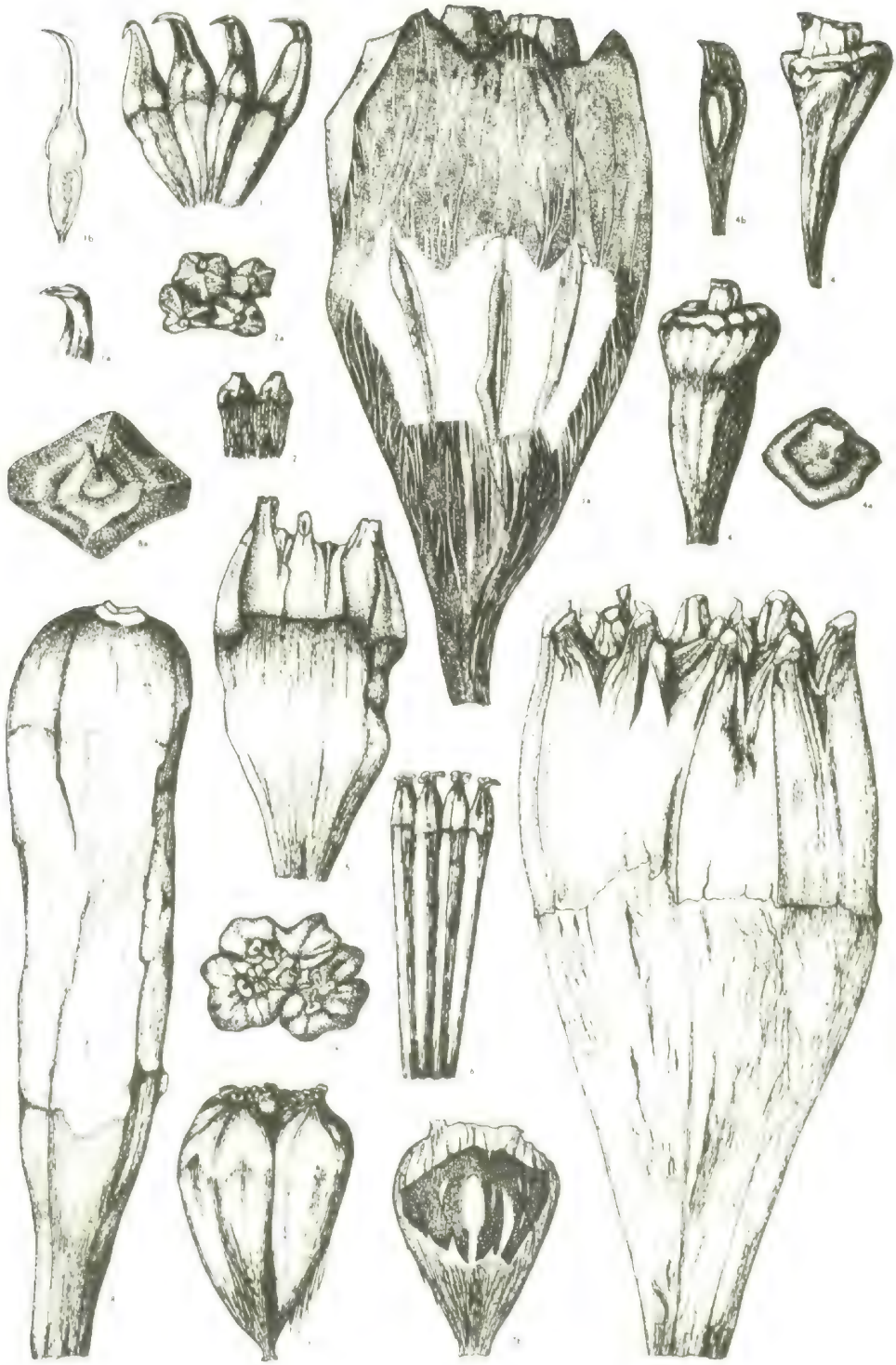
FIG. 7. *Pandanus capitellatus* Merr. & Perry: a phalange; *a*, the same from above; *b*, the same in longitudinal section.

FIG. 8. *Pandanus Jiulianettii* Martelli: a drupe in profile; *a*, the same from above.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

PANDANACEAE FROM NEW GUINEA

FULL-TONE — MERIDEN



PANDANACEAE FROM NEW GUINEA

FULL-TONE — MERIDEN

PALMAE GESAMMELT IN NEU GUINEA VON L. J. BRASS[1]

MAX BURRET

Licuala pendulifera Zipp.

Zu dieser Art scheint mir die folgende Pflanze zu gehören.

PAPUA: Unterer Fly River, Ostufer gegenüber Sturt Island. Sehr häufig im Regenwald an Hängen, 2.5–3 m. hoch, Blätter ± 15 auf langen Blattstielen spreizend, unreife Früchte 10–11 mm. diam. (Oktober 1936 — *L. J. Brass 8168*).

Licuala concinna Burret, spec. nov.

Palma 1.5–2 m. alta. Frondes numerosae, 20–25, erectae, "glaucae".[2] Vagina inter robustiores, superne in fibras firmiores, dense intertextas dissoluta. Petiolus 106 cm. longus, a vagina circ. 25 cm. spinosa, spinulis sat parvis tenuibus, rotundato-triangularis, subtus fusco-purpuraceus, apice 3 mm. fere in diam. Lamina 28 cm. longa, inter tenuiores semiorbicularis, nervis primariis 34, segmentis praeter medianum 4, oblanceolatis, infimis ambobus 21 cm. longis, 4.5–5 cm. superne latis, nervis primariis 5, secundis 25 cm. longis, usque 5–6 cm. latis, nervis primariis 6. Segmentum medianum latiuscule cuneatum, 27 cm. longum, 12 cm. ab apice fissum. Spadix inter graciliores, 40 cm. longus, pedunculus 23.5 cm. longus, spathis 2 linearibus fere obtectus, valde applanatis, inferiore 1.5 cm. lata. Rhachis ut rami fusco-furfuracei. Inflorescentiae partiales 3, nonnihil supra spathas exsertae, ramis 3, suprema 2. Ramus florifer maximus 11 cm. longus, reliqui 8–5 cm. longi, sat tenues. Flores inter minores, in alabastro 4 mm. longi, pedicello 1.5 mm. alto. Calyx ample cupuliformis, i.s. brunneus, 2 mm. fere altus, tenuis, truncatus, apice leviter laceratus. Corolla duplo altior. Staminum annulus dimidiam corollam aequans, conspicue trilobatus, staminibus 3 inter lobos affixis, lobis retusis, ubi staminibus 3 reliquis insertis. Antherae ovales. Fructus globosi, i.s. 1 cm. in diam.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Gemeinste Palme des Waldunterwuchses auf Hügeln, besonders häufig auf den unteren lehmigen Hängen nahe dem Fluss. (Juni 1936 — *L. J. Brass 6894*).

Nach Beccari's Schlüssel schliesst sich die Art an *L. telifera* Becc. an,

[1]Botanical results of the Richard Archbold Expedition.

[2]The words in quotation marks are translations of the collector's notes.

von der sie sich schon durch die zierlicheren Kolben und Wedel und die länger gestielten Blüten unterscheidet.

Licuala angustiloba Burret, spec. nov.

Palma 2–2.5 m. alta, caudice 1.5 m. raro superante. Vagina 30 cm. longa, superne fibrosa-lacerata. Frondes 12–14. Petiolus visus supra vaginam circ. 47 cm. longus, inferne tenuiter acute spinosus, dorsi fusco-purpuraceus, apice 5 mm. latus. Lamina semiorbicularis, 46 cm. longa, nervis primariis 36, segmentis 9. Segmenta inter minus tenuia, anguste linearia, latissimum infimum 43 cm. longum, 3.3 cm. latum, nervis primariis 5, latitudine maxima in dimidia sita, superne modice attenuata. Reliqua visa praeter medianum nervis primariis 2 vel rarius 3, 44 cm. longa, 2.5 cm. lata, superne leviter tantum attenuata. Segmentum medium 44.5 cm. longum, 11.5 cm. a basi connatum, lobis anguste linearicuneatis 1.8 cm. latis. Segmenta subtus pallidiora, in facie minute fusco-leproso-punctata, in costis dense fusco-purpuracea. Spadix 70 cm. longus. Pedunculus 44 cm. longus, ut rhachis fusco-purpuraceus, spathis 2. Inflorescentiae partiales 6, infima supra spatham, superiores ad spatharum os exsertae. Spathae superiores dense fusco-purpuraceo-tomentosae, infundibuliformes. Inflorescentia partialis infima ramis fructiferis 6, minus validis, 7–8 cm. longis, purpuraceis. Pedicellus conspicuus, 1 mm. paululo superans. Calyx cupuliformis. Petala triangularia, breviter contracto-acuminata, acuta. Staminum annulus, ut videtur, 2-lobatus, lobis retusis. Fructus i.s. ambitu globosus, 4 mm. in diam., dense rugosus.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River. Gemein im Waldunterwuchs höherer Hänge. (Juni 1936 — *L. J. Brass 7069*).

Nach dem Schlüssel, den Beccari in seiner Monographie von *Licuala* gegeben hat, schliesst sich die Art an *Licuala telifera* an. Sie unterscheidet sich schon durch schmal lineare Fiedern.

Licuala magna Burret, spec. nov.

Palma speciosa, 7–8 m. alta. Speciminis collecti "caudex 4.8 m. altus, 8.5 cm. diam. infra frondes. Petiolus circ. 80 cm. longus, marginibus usque ad 45 cm. a basi spinosis. Lamina 1.43 m. lata." Vagina tenuiter coriacea. Petioli margines ad basim spinis 3 mm. circ. longis. Lamina suborbicularis, costis circ. 60, segmentis undique radiantibus; medianum 85 cm. longum, curvatum, versus apicem 9 cm. latum, reliqua plerumque conspicue vel nonnihil angustiora, omnia robusta. Spadix magnus, robustus. Pedunculus spathis usque 4 cm. latis. Inflorescentiae partiales circ. 8, inferiores magnae, robustae, sat irregulariter multiramosae,

fusco-purpuraceae. Rami fructus immaturos gerentes robusti, usque 14 cm. circ. longi. Pedicellus brevis, sed tamen bene conspicuus, 1 mm. paulo superans, validus. Perianthium fructiferum 3 mm. altum, calyce subcylindrico modice dilatato. Petala brevia, basi supra calycem lata, breviter contracta, peracuta, extus nervis paucis bene conspicuis percursa.

PAPUA: Palmer River, 2 Meilen unterhalb de Vereinigung mit dem Black River, 100 m. Höhe. Gemein im Bergwald (Juni 1936 — *L. J. Brass 7136*).

Die Art erinnert am meisten an *L. Lauterbachii* Becc., von der sie sich schon durch die sehr kurz zusammengezogenen Blumenblätter der weiblichen Blüten und Früchte unterscheidet, die der genannten Art sind gestreckt dreieckig.

Livistona crustacea Burret, spec. nov.

"Palma circ. 10 m. alta. Petiolus ± 90 cm. Lamina ± 80 cm. longa. Panicula 1.4–1.6 m. longa. Fructus nigro-purpurei, pruinosi." Petiolus supra concavus, basin versus canaliculatus, ad margines inferne aculeis atris subtriangularibus maximis, inferioribus ad 3 mm. longis, superioribus sensim minoribus armatus, subtus, supra superne tantum trichomatibus crustaceis haud laciniatis, saepe pluribus approximatis atque 2–3 circ. congestis, subtus atrorubris, supra albidis maculatus. Lamina inter minus robustas, a ligula 78 cm. longa, ad magnam partem indivisa, segmentis circ. 60, media in parte libera 35 cm. longa, nervis secundariis in quoque latere circ. 10 et paulo ultra, utrinque conspicuis, transversalibus prominentibus, bifida, 5–10 cm. ab apice fissa, ad basin 2.5 cm. in diam., superne sensim attenuata, lobis sensim angustatis, longe, anguste acuminatis, segmenta lateralia multo angustiora, breviora, omnia apice nonnihil bifida. Spadicis spathae cylindricae, anguste vaginantes, apice obtusae. Inflorescentia partialis spathella propria spatham primariam superante, magna, 3-plo ramosa. Rami fructiferi inter breviores, 7 cm. circ. longi, demum fere glabrati. Pedunculus fructifer perbrevis, fructus 1–2 gerens. Fructus i.s. fere nigri, obovati, sine perianthio 9 × 7.5 mm., apice rotundati. Pericarpium 0.5 mm. in diam. Semen globosum, 6.5 mm. in diam., intrusione usque ad dimidiam producta.

PAPUA: See Daviumbo, mittlerer Fly River. Einzeln oder in kleinen Gruppen am Seeufer, weniger häufig bis zur trockenen Savanne. Blattbasen an jungen Bäumen persistierend (September 1936 — *L. J. Brass 7668*).

Die Art ist ausgezeichnet durch die krustenförmigen Trichome des Blattstiels, die sich auch auf den Rippen der Blattunterseite nahe der Basis finden.

Livistona melanocarpa Burret, spec. nov.

"Palma 16 m. alta, 19 cm. in diam., frondium basibus persistentibus. Petiolus usque 1.5 m. longus, lamina usque 1.2 cm. Spadices plures, 2–2.1 m. longi." Petiolus supra vaginam 2 cm. latus, spinosus, supra profunde canaliculatus, triangulariter rotundatus, subtus paleis, ambitu oblongis vel ovalibus sat irregularibus, margine laciniatis, densissime pallide furfuraceus, spinis atrobrunneis triangularibus 3 mm. longis. Frons visa, basi petiolo 1.5 cm. in diam. metiente, inermi supra plano subtus rotundato marginibus acutis, a basi ad apices 90 cm. circ. longa, ad magnam partem integra, segmentis apicalibus 47 cm. longis, usque 26 cm. bifidis, lobis sensim attenuatis, acuminatis, inter minus robustas, supra i.s. leviter rubiginosa, subtus viridis. Segmenta 70, filis nullis interpositis, dextra sinistra nervis circ. 10 transversalibus conspicuis, apicalia 2 cm. circ. ad basin, ubi libera, lata, inferiora multo angustiora. Spadicis inflorescentia partialis magna fructifera 45 cm. circ. in parte ramosa longa, parte pedunculari circ. aequilonga, pedunculus partialis ad basin spathella anguste vaginante glabra ancipite. Panicula 3-plo multiramosa. Rami fructiferi minores circ. 8, majores circ. 14 cm. longi, fere glabrati. Pedunculi fructiferi parvi, sed conspicui, fructus 1–2 gerentes. Fructus parvi, i.s. atrocoerulei vel fere nigri, obovati, basi late sed conspicue producti, apice late rotundati, sine perianthio 9–10 cm. longi, 7–8 mm. lati. Pericarpium 1 mm. fere in diam. Semen globosum, 7 mm. longum, latitudine paulo angustius, ruminatione usque ad dimidiam producta.

PAPUA: Davu Island, Western Division (9 März 1936 — *L. J. Brass 6310*).

Zur gleichen Art gehört zweifellos ein Stück eines Blütenkolbens, das von Herrn Brass ausdrücklich als das Blütenmaterial zu no. 6310 bezeichnet wird. Es folgt die Beschreibung:

Spadix florifer ut in n. 6310 ramificatus, spatha et spathella glabris, ramis et ramulis breviter albido-pubescentibus. Pedunculi breves, sed conspicui, flores 1–2 gerentes. Flores parvi, 2 mm. in diam. Calyx lobis ovatis. Corolla lobis ovato-oblongis. Stamina in parte libera sat producta.

PAPUA: Davu Island, Western Division. Isolierte Exemplare in den Savannenwäldern der Insel (März 1936 — *L. J. Brass 6406*).*

Unterscheidet sich von *L. Woodfordii* besonders durch die gestreckten

*Vor Abschluss kommt mir gerade noch folgende Pflanze zu Gesicht, die wohl zur gleichen Art gehört. Oberer Wassi Kussa River (linker Arm), Western Division, Sumpfrand, brackig in der trockenen Zeit, 25 m. hoher Baum. Kolben 1.5–1.6 m. lang, meist mit 8 Aesten. Frucht schwarz (Januar 1937 — *L. J. Brass 8045*).

an der Basis vorgezogenen kleinen Früchte. Bei *L. Woodfordii* sind die Früchte breiter als hoch und grösser. Auch sind die Partialinfloreszenzen stärker verzweigt. Zu vergleichen wäre noch *L. Benthami* Bail., von der mir leider kein Material vorliegt, die mir aber verschieden zu sein scheint. *Livistona humilis* ist gut unterschieden, die Blüten bilden regelmässige fest sitzende Knäuel auch sind die Früchte abweichend. Von *L. papuana* liegt kein Material vor, sie soll aber stets einzelne Blüten haben. Es ist also anzunehmen, dass es sich um eine neue Art handelt.

Metroxylon Rumphii Mart. var. **flyriverense** Becc. in Ann. Bot. Gard. Calcutta **12, 2:** 178, *tab. 107.* (1918).

Die vorliegenden Früchte sind unreif.

PAPUA: Unterer Fly River, Ostufer gegenüber Sturt Island. Sago-Palme. Regenwald, reine Sumpfwaldbestände in dieser Gegend von geringer Ausdehnung und nicht sehr grossen Exemplaren bildend. Durchschnittsmasse: 17 m. bis zum Gipfel des Fruchtstandes, der zylindrische Stamm 10 m. lang bis zum untersten Blatt und 36 cm. im Durchmesser nahe der Basis, das 1.50 m. lange Ende umfasst der kandelaberförmige Fruchtstand mit spreizenden Aesten. Stamm unter den Blättern mehr oder weniger von den dornigen Resten der alten Blattstiele bedeckt. Blätter nach oben im Umfang abnehmend, das unterste 6 m., ein oberes 2 m. lang, ohne Blattstiel, der des untersten Blattes 1.69 m. lang. Blattstiel tief und glatt rinnig nach unten in eine breite stammumfassende Basis verbreitert, welche unten stachelig ist, mit kurzen Stacheln in Querreihen, oberer Blattstiel und Rhachis bei erwachsenen Bäumen völlig stachellos, Blätter junger Bäume (Wurzelschosse) sehr stachelig mit 10–15 cm. langen Stacheln an den Blattstielen und weithin sich ziehenden Reihen kürzerer Dornen an der unteren Rhachis. Primäräste des Fruchtstandes 18 (doppelt verzweigt), unterster 3 m. lang, oberster 2 m. lang, unterstes Viertel der Primäräste mit angedrückten leeren Brakteen besetzt, unreife Frucht ± 3 cm. Durchmesser, grün (Oktober 1936 — *L. J. Brass 8111*).

Korthalsia Brassii Burret, spec. nov.

Frondis vagina caudicem cingens 3 cm. diam. superans, ad maximam partem aculeis patentibus rectis applanatis 3–4 mm. longis densiuscule vel dense armata, furfure pallide cinnamomeo tenuiter obtecta. Ochrea magna, explanata, 32 cm. longa, late lanceolata, 6 cm. circ. lata, tenuiter coriacea, extus inferne aculeis descriptis sat dense praedita, superne paucioribus, parvis. Petiolus visus 24 cm. longus. Rhachis segmenta gerens 85 cm. circ. longa, utrinsecus segmentis 7. Petiolus dilatatus,

inferne 8 mm. latus, utrinque laevis, ad margines spinis parvis haud curvatis, ut rhachis tenuiter pallide furfuraceus. Rhachis aculeis curvatis unguiformibus inferne simplicibus, superne bi- vel etiam trifidis. Cirrhus in fronde visa rhacheos circ. longitudinis, aculeis unguiformibus 3–5-fidis sat densis, minoribus simplicibus intermixtis. Segmenta firmiuscule papyracea, i.s. supra viridia, subtus densissime albo-induta, obovato-rhomboidea, ad ⅔ longe latiuscule cuneata, dein triangulariter sinuato-dentato-acutata et ± modice acuminata, in nervis acute producto-dentata, majora circ. 30 cm. longa, 9 cm. lata, nervis 12 percursa, apicalia et basilaria modice minora, omnia regulariter disposita, basi conspicue stipitata, stipite usque 1 cm. longo, nervis transversalibus undulatis supra bene conspicuis. Spadix "85 cm. longus", duplicato-ramosus, inflorescentiis partialibus pluribus prob. mediis 28 cm. circ. longis, ramos fructiferos divergentes 6–7 gerentibus. Spathae robustae, decidue tabacino-purpuraceae, inermes, nonnihil infundibuliformiter dilatatae, apice triangulares. Rami primarii ad apicem spatharum orientes, spicae fructiferae ex spathellis minus infundibuliformibus, usque 15 cm. longae, crassae, fructos immaturos gerentes i.s. 8 mm. fere in diam., tomentosae, spathellis acute triangularibus, dense nervosis, superne spectantibus. Fructus spicae nonnihil immersi, immaturi obovati, cum apice angusto stigmatifero 1.5 mm. alto 1 cm. longi, superne 0.7 cm. in diam. Corolla sat explanata, inciso-trilobata, lobis ovatis. Squamae in orthostichis 15 dispositae, flavae, rhomboideae, parvae, dimidiam secus leviter sulcatae. Semen immaturum.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River (Juni 1936 — *L. J. Brass 6864*).

Die Ochrea ist nicht aufgeblasen, die Blattrhachis besitzt beiderseits 7 Fiedern. Der Stamm ist relativ kräftig, der Kolben doppelt verzweigt. Nach dem von *Beccari* in Ann. Bot. Gard. Calcutta **12, 2:** 107–145 (1918) gegebenen Schlüssel scheiden alle bekannten Arten bis auf die immerhin näher verwandte *Korthalsia Zippelii* Bl. aus. Aber auch von dieser ist die vorliegende stark verschieden. Es ist die zweite Art aus Neuguinea.

Ich widme sie dem Entdecker.

Calamus Hollrungii Becc. in K. Schum. et Hollrung, Fl. Kais. Wilh. Land, 17 (1889).

Hiermit dürfte auch *C. latisectus* Burret in Notizbl. Bot. Gart. Mus. Berlin **13:** 319 (1936) mit ausgewachsenen Früchten identisch sein.

PAPUA: See Daviumbo, mittlerer Fly River. In Mengen im Regenwald, bis zum Gipfel der Bäume klettend. Stamm bläulich, ± 2 cm.

im Durchmesser, Blätter über 2.5 m. lang. Rispen ± 2.5 m. lang (August 1936 — *L. J. Brass 7492*).

Calamus Warburgii K. Schum. in Schum. et Lauterb. Fl. Deutsch. Schutzgeb. Südsee, 203 (1901).

PAPUA: Palmer River, 2 Meilen unterhalb des Vereinigung mit dem Black River, 100 m. Höhe. Beschränkt auf die schlammigen Flussufer und Ueberschwemmungsebenen des Flusses, dort in grossen Massen vor dem Walde, 10–15 m. an den Bäumen hoch kletternd. Blätter einschliesslich Cirrhus ± 3.5 m. lang, Fiedern bis ± 2 m. von der Basis ab (Juli 1936 — *L. J. Brass 7326*).

Calamus Warburgii ist mit unreifen Früchten beschrieben. Die neuen Früchte leg. *Brass* sind etwa doppelt so gross. In die nächste Verwandtschaft gehört *C. sepikensis* Becc.

Calamus laceratus Burret in Notizbl. Bot. Gart. Mus. Berlin, **13**: 318 (1936).

Weicht vom Typus kaum ab, es könnte sich höchstens um eine Varietät handeln. Die Spathella etwas weniger stachelig, die Fruchtäste kürzer.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Hoch kletternde, ziemlich schlanke Art, gemein auf Hängen (Juli 1936 — *L. J. Brass 7265*).

Calamus eximius Burret, spec. nov.

Caudex cum vagina circ. 2 cm. diam. Vagina flagellifera, robusta, fusco-leprosa, aculeis transverse serratis robustis, ad 3 cm. longis, late applanatis. Frondes prob. magnae, non cirrhiferae. Petiolus brevis, aculeis applanatis densissimis. Rhachis utrinque furfuraceo-albotomentosa, supra aculeis sat parvis patentibus, vix curvatis, subtus curvatis simplicibus vel 2–3-fidis. Segmenta numerosa vel numerosissima, ut videtur, regulariter disposita, anguste linearia, acuminata, utrinque viridia, nitentia, inferiora 37 cm. longa, 1.5 cm. circ. lata, segmenta rhacheos apicem versus sensim breviora, angustiora, omnia nervis validis 3 utrinque setosis percursa, ad margines setosa. Spadix, ut videtur, magnus. Spatha primaria visa magna, robusta, fissa. Inflorescentia partialis magna, robusta, in parte ramosa 30 cm. circ. longa, spicis fructiferis circ. 15. Spathae secundariae vix infundibuliformes, apice acute triangulares, extus detergibiliter furfuraceae. Spicae supra spatharum apicem orientes, 10–12 cm. longae, crassae. Spathellae densissime distichae, atrofuscae, furfuraceae, maxime dilatatae. Flores ♀ valde numerosae. Fructus badii, involucrophoro non pedicellato. Perianthium fructiferum non pedicellatum, profunde fissum. Fructus nondum

maturus longe rostratus, parvus, cum rostro 4 mm. longo, sine perianthio 12 mm. altus, in parte erostrata globulosa 7–8 mm. diam. Squamae in orthostichis 23, basi modice productae. Semen nondum maturum. Albumen aequabile.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Gemeiner, grosser Rottan, Bergwald (Juli 1936 — *L. J. Brass 7216*).

Scheint am besten in Beccari's Gruppe VI zu passen. Eine sehr auffallende Art.

Calamus distentus Burret, spec. nov.

Tenuis, gracilis. Caudex vaginatus 1 cm. in diam. vix superans, ipse circ. 6 cm. diam. Vagina setis numerosis sat densis circ. 1 cm. longis badiis vel fere fuscis praedita, glabra vel glabrata. Ochrea 8 cm. longa, lineari-lanceolata, iisdem setis dense obtecta. Fagella in vagina visa nulla. Frons non cirrhifera, 70 cm. circ. longa. Petiolus fere nullus, 1.5 cm. longus, ut vagina setosus. Rhachis glabra, subtus aculeis numerosis parvis, omnibus simplicibus, paulo curvatis, segmentis utrinsecus 11. Segmenta inferiora 3 irregulariter dispersa, dimidiae rhacheos 6 per greges 3 dissitos regulariter dispositos, bina basi dense juxtapposita, valde divaricata, lanceolata, circ. 25 cm. longa, 3 cm. lata, papyracea, utrinque nitentia, i.s. subtus leviter pallidiora, basin versus attenuata, apice sat breviter acuminata, acutissima, nervis 5, medio quam lateralibus nonnihil validiore, nervis haud setosis, nervis transversalibus utrinque bene conspicuis; segmenta suprema 2 nondum descripta quam reliqua nonnihil minora, quorum apicalia ambo 7–7.5 cm. tantum longa, 1–1.5 cm. longe ad basin connata. Spadix fructifer elongatus, flagelliformis, tenuissimus, pedunculo flagelliformi longissimo aculeis parvis recurvatis numerosis praedito, inflorescentiis partialibus paucis remotis. Spathae primariae longissimae, angustissimae, sat dense aculeatae. Inflorescentia infima maxima 17 cm. longa, spicis fructiferis 11; spathae secundariae angustissimae, inermes; spicae ad spatharum os insertae, maximae 5.5 cm. longae, fructus in quoque latere usque 10 gerentes, ad fructuum insertiones conspicue flexuosae, spathellis late infundibuliformibus, involucrophorum prope apicem spathellae insertum, cupuliforme. Perianthium fructiferum fere explanatum. Calyx basi callosus, profunde lobatus, lobis ovato-oblongis. Corolla lobis 3 lanceolatis quam calycis lobi paulo longioribus. Fructus late ovati, cum perianthio et apice sat tenui brevi 1 mm. longo, 1.3 cm. alti, 10 mm. circ. lati; squamae in orthostichis 18, flavidae, haud sulcatae, margine brunneo, apice triangulari. Semen depresso-globosum, 7 mm. latum, fovea in rhapheos latere sat profunda. Albumen homogeneum.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Schlanke Art des Unterwuchses, gemein im Wald der Berghänge (Juni 1936 — *L. J. Brass 7151*) Typus. — Ebenda, bis etwa 10 m. hoch kletternd, gemein (Juni 1936 — *L. J. Brass 6895*).

Gehört zu Beccari's Gruppe V, und zwar in die Verwandtschaft von n. 42, *C. Muelleri* Wendl.

Calamus reticulatus Burret, spec. nov.

Caudex cum vagina 3.5 cm. circ. diam. Vagina praecipue superne gracillime, tenuissime, dense reticulata, ceterum setis pallide badiis dense obtecta. Flagellum ex vagina oriens longissimum aculeis curvatis simplicibus vel 2–3-fidis, unguiformibus armatum. Petiolus in specimine viso 18 cm. longus, applanatus, supra et ad margines aculeis ± patentibus parvulis, subtus unguiformibus praeditus. Frondes magnae, segmentis numerosissimis dense, regulariter dispositis. Rhachis subtus levissime purpuracea, fere glabrata, aculeis recurvatis, simplicibus armata. Segmenta infima angustiora modice minora, rhacheos apicem versus segmenta sensim longitudine et latitudine decrescentia, omnia anguste linearia, apice acuminata, nervis validis 3 percursa, supra praecipue in lateralibus ambobus setosa, subtus in costa media, praeterea ad margines setosa, praeter nervos validos subtus tenuioribus pluribus longitudinaliter percursa atque transversalibus, irregularibus interruptis, supra paulo conspicuis, i.s. utrinque concoloria, viridia, glabra, maxima visa dimidiae laminae circ. 30 cm. longa, 1.5 cm. in diam. Spadix maximus, superne in flagellum longum exiens, aculeis curvatis simplicibus et 2–4-fidis unguiformibus armatus, et rhachis reliqua aculeis recurvatis simplicibus et rarius 2–3-fidis praeditae, pars peduncularis longissima. Spathae primariae cylindricae, anguste vaginantes, versus apicem tantum saepe laceratae. Inflorescentiae partiales 3, remote sequentes, magnae, infima 85 cm. circ. longa, spicis 17 laxissime sequentibus. Spathae secundariae levissime infundibuliformes, apice nigrescente, saepe leviter lacerato, extus aculeis parvis recurvatis sat numerosis praeditae. Spicae fructiferae ad spatharum os orientes circ. 8–13.5 cm. longae, tenues, inermes, fructus utrinsecus 12–20 gerentes. Spathellae sat late infundibuliformes. Fructus ad spathellarum os inserti. Perianthium fructiferum profunde fissum et superne patens, ad basin tamen sat callosum. Fructus i.s. cum perianthio et apice 1.5 mm. longo, tenui, 1.8 cm. alti, 1 cm. in diam., ambitu ovato-elliptici. Squamae flavidae, in orthostichis 18, late triangulares, apice haud producto. Semen in statu viso superficie rugoso, ambitu circ. semiglobosum. Albumen homogeneum.

PAPUA: Fly River, 528 Meilen-Lager, 80 m. Höhe. Beschränkt auf

sonnige Stellen an Flussufern, sehr häufig, ± 10 m. hoch an Waldbäumen kletternd (Mai 1936 — *L. J. Brass 6811*).

Gehört zu Beccari's Gruppe V. Ausgezeichnet ist die Art besonders durch die feinnetzige Scheide, die mit relativ langen hellbraunen Borsten dicht bedeckt ist.

Calamus altiscandens Burret, spec. nov.

Caudex cum vagina 2.5–3 cm. circ. diam. Vagina robusta, fusco-leprosa, aculeis inferne applanatis, basi sat robustis, superne in setas flavidas exeuntibus, solitariis vel saepius ± transverse seriatis, numerosis armata, flagellifera. Ochrea 10 cm. circ. longa, lata, aculeis quam in vagina ipsa minoribus, flavide setosis, basi applanatis in seriebus ± longis conspicuis transversis conjunctis. "Frondes haud cirrhiferae, 1.4–1.6 m. longae." Petiolus robustus, 20 cm. vix longus, compressus, supra et lateraliter aculeis applanatis minoribus patentibus armatus. Rhachis glabra inferne supra aculeis in petiolo descriptis praedita, superne inermis, subtus aculeis curvatis simplicibus vel 2–3-fidis unguiformibus armata. Segmenta in fronde visa utrinsecus 16, per greges disposita, infima irregularia, minus dense aggregata, reliqua praeter apicalia et solitarium interjectum dense ad 2–3 juxtapposita, divaricata, superiora quam reliqua minora, basilare 42 cm. longum, usque 3 cm. fere latum, maxima visa mediae circ. rhacheos 52 cm. circ. longa, 3.3 cm. lata, praeter apicalia omnia linearia, apice breviter acuminata vel potius contracta, saepe fissa, inter robustiora, utrinque nitentia, viridia, subtus i.s. vix pallidiora, nervis validis 3 percursa atque pluribus minus validis, transversalibus dense sequentibus, supra optime, melius quam subtus conspicuis, setis ad margines apicem versus tantum obviis. Segmenta apicalia ambo inferne longe connata, ab ima basi 24 cm. longa, 10 cm. circ. ab basi connata, angulum acutissimum includentia. Spadix magnus robustus, longus, apice in flagellum longum exiens, visus sine flagello circ. 1.60 m. longus. Pars peduncularis 40 cm. fere longus, robustus, aculeis patentibus, inferne applanatus. Inflorescentiae partiales 8. Spathae primariae fere coriaceae, longae, superne dilatatae, apice triangulares, demum usque ad basin fere fissae, sed non laceratae, infima et supremae tantum aculeatae, infima aculeis patentibus, superne fere setosis, supremae aculeis brevibus sed validioribus, retrorsis, reliquae inermes, glabratae. Inflorescentiae partiales profunde in spathis primariis orientes, majores 23 cm. circ. longi, ramos fructiferos circ. 16 exserentes. Spathae secundariae fere cylindricae, leviter superne dilatatae. Rami fructiferi ad spatharum os inserti, inter validiores, 12–5 cm. longi. Spathellae nonnihil dilatatae, in ramo majore circ. 40. Fructus supra spathellarum margines inserti, plerumque gemini. Involucrophorum cupuliforme. In-

volucrum cupuliforme. Fructus juveniles. Perianthium fructiferum pedicelliforme. Fructus ovato-rostrati. Squamae flavidae.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Gemein in den Wäldem, in besonders grossen Mengen in Einschnitten zwischen den Berghängen. Grosse Art (Juli 1936 — *L. J. Brass 7327*).

Diese Art scheint mir in Beccari's Gruppe VII zu gehören.

Arenga microcarpa Becc. in K. Schum. et Hollr. Fl. Kais. Wilh. Land 16 (1889).

PAPUA: Unterer Fly River, Ostufer gegenüber Sturt Island. Stämme bis 8 m., Blattbasen persistierend, Blätter etwa 8, Lamina 3.5 m., Petiolus 65 cm., unterste Inflorescenz 1.65 m., einschliesslich Pedunculus, welcher 55 m. lang, Frucht rot (Oktober 1936 — *L. J. Brass 8167*).

Orania Lauterbachiana Becc. in Bot. Jahrb. **52**: 36 (1914).

PAPUA: Fly River, 528 Meilen-Lager, 80 m. Meereshöhe. Sporadisch im Unterholz des Bergwaldes. Auffallende starke Palme, ± 15 m. erreichend. Blatt- und Blütenmaterial von einem Baum, dessen Stamm 9 m. hoch ist und 20 cm. Durchmesser über der basalen Anschwellung hat, 10 Blätter, ± 3.5 m. lang, ein axillärer Kolben, 1.5 m. lang, aufrecht zwischen den Wedeln. Blattstiel ± 2 m. lang, braunfilzig bis zu ¼ seiner Länge von der Basis den Stamm umfassend, nicht scheidig. Blattsegmente steif, unterseits grau. Frucht orangerot mit 1, 2 oder 3 Samen (Mai 1936 — *L. J. Brass 6610*).

Die distich an dicken, nach unten 4-kantigen Astenden angeordneten männlichen Blütenpaare und der graubräunliche Filz der Aeste sind für die Art sehr charakteristisch. Auch stimmen die weiblichen Blüten gut überein. Die Mittelrippe des Wedels ist mit einem allerdings abfälligen dicken, graubraunen Filz bedeckt. Eine grosse Fieder ist 1.30 m. lang, bis 7.5 cm. breit, am Scheitel gleichseitig 3-eckig vorgezogen, beiderseits praemors. Unterseits ist dieselbe von einem nicht sehr dicken, aber dichten weichen, silberweissen Filz bedeckt, der sich mit dem Fingernagel abschaben lässt, worauf die deutlichen feinen Längsnerven zwischen den stärkeren Rippen sichtbar werden. Ein Endstück des Wedels zeigt jederseits 3–5 schmäler und kürzer werdende Fiedern, die, wie bei der grossen Fieder beschrieben, ebenfalls beiderseitig am Scheitel abgebissen sind, sie sind regelmässig angeordnet. Zwei 2-lappige, grosse Früchte haben 9.5 cm. im grössten Durchmesser. Jede Einzelfrucht ist quer 5.5 cm. breit. Das Fruchtperianth misst zwischen 2 Spitzen 1.5 cm. Die Kelchzipfel sind mehr gestreckt und spitz dreieckig, die der Krone

sind sehr breit und stumpfer dreieckig. Das Mesocarp misst trocken 2 mm., der Same 3.7 cm. im Durchmesser.

Orania Archboldiana Burret, spec. nov.

Frondis fragmentum basilare segmentis infimis angustis, apice oblique acuminatis, prob. medium segmentis irregulariter per greges dispositis, directione variantibus. Segmenta utrinque viridia, glabra, 70 cm. circ. longa, 5 cm. lata, in margine superiore tantum producta, in inferiore valde oblique lobulato-praemorsa. Fragmentum apicale jam segmentis irregulariter per greges dispositis, apice transverse lobulato-praemorsis. Spadix florifer 90 cm. fere longus, duplicato-ramosus. Spatha inferior crassa, dense, valde prominenter costata, superior spadicem superans, lignoso-coriacea, apice anguste acuminata, summo anceps, extus fere laevis, tenuissime cinereo-cinnamomeo-tomentosa. Pedunculus 30 cm. longus, trichomatibus subfasciculatis, atro-cinnamomeis, inferne densissimis praeditus. Rhachis 26 cm. circ. longa, iisdem trichomatibus superne pallidis, in ramis minus densis, in ramulis floriferis raris. Rami primarii numerosi, ramulos floriferos plures exserentes. Rami floriferi majores circ. 25 cm. longi, tenues, leviter undulati, superne pertenues, ad magnam partem florum glomerulos 3-floros, flore ♀ intermedio, gerentes, ad apicem flores ♂ geminos. Flores ♂ fere lineares, 5 mm. et paululo ultra longi, 2 mm. vix in diam. Calyx brevis, trilobatus, petala linearia. Stamina 6, antheris linearibus, basi sagittatis. Flores ♀ juveniles subpyramidati.

PAPUA: Unterer Fly River, östliches Ufer gegenüber Sturt Island. Früchte meist einsamig, ± 4 cm. Durchmesser, anscheinend grün (Oktober 1936 — *L. J. Brass 8225*).

Hiermit ist sicher völlig identisch die folgende Pflanze nach der ich Ergänzungen zu der obigen Beschreibung beifüge: Rhachis pallide fusco-furfuracea. Segmenta per greges conspicue interruptos irregulariter disposita atque directione variania, infima in margine superiore valde producta, media in parte superiore sed minus longe producta, maxima visa 80 cm. longa, 5.7 cm. lata. Ramus primarius in ramulis flores majores jam gerens 50 cm. longus. Rami floriferi usque ad apicem fere flores ♀ gerentes. Flores ♀ ovati, 2.5 mm. longi. Calyx brevis, leviter 3-lobatus. Petala fere linearia. Staminodia 6, anguste dentiformia. Fructus saepe simplices, basi carpidiis sterilibus bisaccati, extus i.s. rugulosi, globulosi, 4 cm. in diam. Pericarpium tenue, 1.5 mm. in diam. Semen 2 cm. latum, 1.7 cm. altum. Embryo paulo infra apicem situs.

PAPUA: Unterer Fly River, Ostufer gegenüber Sturt Island, Regenwald, zerstreut im Unterwuchs an Hängen. Stamm 4–6 m. lang, Wedel

± 10, gebogen, Lamina 2.25 m., Petiolus 90 cm. über der stammumfassenden Basis (= 20 cm.), Spadix 1.33 m. lang, achselständig, aufrecht zwischen den Wedeln (Oktober 1936 — *L. J. Brass 8184*).

Zur gleichen Art gehört auch das folgende Fruchtmaterial: PAPUA: Fly River, Oroville Lager. Gemein im Unterwuchs des Regenwaldes. Stamm kräftig, ± 15 m. lang, 6 cm. im Durchmesser unter den Wedeln. Wedel 6, plumos, ± 2.7 m. lang (Petiolus und scheidige Basis 1.12 m., Lamina 1.60 m.), Fiedern unterseits grau. Ein Kolben mit jungen Früchten 96 cm. lang, einer ohne Blüten und Früchte 1.35 m. lang. Junge Früchte bis 4 cm. in Durchmesser (August 1936 — *L. J. Brass 7403*).

Eine interessante neue Art, die an *Orania macrocladus* Mart. erinnert, mit der sie auch in den bis nahe dem Scheitel der Aeste dreizähligen Blütengruppen, den männlichen Blüten und dem vorgezogenen oberen Rande der Fiedern — abgesehen von den apikalen erinnert. Auf der Abbildung in Ann. Gard. Bot. Buit. **2:** tab. 13 ist jedoch deutlich zu sehen, dass deren Fiedern regelmässig angeordnet sind, während hier die Fiedern deutliche Gruppen bilden und sogar nach verschiedenen Richtungen abgehen, sodass die Wedel ein plumoses Aussehen haben. *Orania macrocladus* unterscheidet sich ausserdem durch unterseits weissfilzige Fiedern. Auch liegt bei ihr der Embryo angeblich in der unteren Hälfte des Samens.

Linospadix longicruris (Becc.) Burret in Notizbl. Bot. Gart. Mus. Berlin **12:** 331 (1935).

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Gelegentlich im Unterwuchs des Bergwaldes. Mehrere Stämme ± 1.5 m. lang (*L. J. Brass 6993*). Fly River, 528 Meilen-Lager, 80 m. Höhe. Im Unterwuchs des Bergwaldes, sporadisch bis gemein, Palme 1–1.50 m. hoch, 1 bis mehrere Stämmchen, reife Frucht rot (*L. J. Brass 6625, 6745, 6807*). See Daviumbo am Mittleren Fly River, Unterwuchs des Regenwaldes, reife Frucht rot (*L. J. Brass 7907*).

Paralinospadix lepidotus Burret, spec. nov.

Palma 4–5 m. alta. Frondis vagina extus leproso-fusco-maculata, apice tenuiter lacerato-fibrosa. Petiolus 44 cm. longus, subtus late rotundatus, ut rhachis decidue fusco-leproso-lepidotus, supra fere planus, inferne vix excavatus, ad basin 6 mm. latus. Rhachis 40 cm. longa, segmentis utrinsecus 10. Segmenta valde irregulariter per greges disposita, in fronde visa 4 ad basin imam utrius lateris aggregata, quorum ima ambo retrorsa, reliqua patentia vel porrecta, apicalia 5 utrinsecus aggregata, in dimidio circ. spatio inter gregem basilarem et apicalem

17–18 cm. longo utrinsecus segmentum unicum insertum. Segmenta inter rigidiora, supra i.s. colore atro, subtus brunneo, oblanceolata, apice nonnihil anguste acuminata, levissime falcata, nervo primario unico percursa, subtus inferne hinc inde palea lineari, badia, in dimidia affixa praedita, dextra sinistra nervo quam primario modice tenuiore, praeterea numerosis tenuioribus utrinque bene conspicuis. Spadix 1.25 m. circ. longus. Spatha inferior communis fere linearis, 30 cm. longa, spadices partiales collaterales 6 exserens, omnes spatha secundaria propria anguste vaginante, atro-fusco-lepidota, paleis angustis, sat longis, ± tortis, pedunculum proprium superante. Pedunculi tenues, paleis jam in spatha descriptis linearibus atro-fuscis, tortis numerosissimus obsiti. Spica pedunculo circ. aequilonga, tenuis, inter florum glomerulos paleis descriptis obtecta. Florum glomeruli in spica sat dense dispositi, ad maximam spicae partem 3-flori, ♀ intermedio. Axis sub glomerulis producta, late rotundata. Flores ♂ delapsi, ♀ : sepala $\frac{1}{2}$ petalorum altitudinem vix aequantia, late rotundata, cucullata, petala ovata, apice breviter triangulari imposito, extus dense nervosa.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Meereshöhe, nicht häufig, von lokaler Verbreitung im Bergwald. Schlanke Art des Unterwuchses. Stamm glatt, braun, mit deutlichen Blattringen (Juli 1936 — *L. J. Brass 7316*). Typus.

Hierzu gehört zweifellos das nachstehend beschriebene Fruchtexemplar. Der Wedel ist ausgewachsen, der oben beschriebene jedenfalls nach nicht ganz. Ich gebe daher die grösseren Masse. Hiernach werden auch die Früchte beschrieben: Petiolus 64 cm. longus, basi 7 mm. latus. Rhachis 50 cm. longa, lamina 78 cm. Segmenta utrinsecus 10–12, 3–4 basilaria utrius lateris aggregata atque 2–4 apicalia, per spatium inter gregem basilarem et apicalem segmenta 2–4 inspersa. Segmenta maxima circ. 40 × 5.5 cm. Spadix fructifer circ. 1.40 m. longus, spica pedunculum circ. aequante. Fructus i.s. 9 mm. longus, 4.5 mm. fere in diam., apice crassiuscule, modice rostratus, basi acuminatus, sclerosomatibus densissimis, nonnihil prominentibus breviter lineolato-tuberculosus. Albumen aequabile. Perianthium cupuliforme, 3 mm. altum. Calyx obliquus, scutellatus, $\frac{1}{3}$ circ. perianthium altitudine aequans, sepala late ovata, rotundata, laevia, petala latissime ovata, apice breviter triangulari imposito.

PAPUA: Fly River, 528 Meilen-Lager, 80 m. Meereshöhe. Gelegentlich im Waldunterwuchs. Schlanke 8–10 m. hohe Palme. Material von einem Individuum, dessen Stamm 5 m. hoch, 2.5 cm. im Durchmesser am oberen Ende, 4 cm. an der Basis misst. Stamm rötlich, Blattringe deut-

lich. Blätter 12, ± 1.50 m. lang. Kolben axillär mit 7 langen, hängenden Aesten, bis 1.40 m. (Mai 1936 — *L. J. Brass 6716*).

Zur gleichen Art gehört zweifellos noch das nachstehende blühende Exemplar, an dem sich noch männliche Blüten finden, deren Beschreibung ich beifüge: Florum ♂ alabastra ambitu ovalia, 2.5 mm. longa. Calyx 1 mm. fere altus, breviter cupuliformis, sepala inferne carinata, apice late rotundata. Petala elliptico-oblonga, apice obtusa. Stamina 6, antherae lineares, basi profunde sagittatae, dorso affixae. Pistillodium longitudine staminum.

PAPUA: Fly River, 528 Meilen-Lager, 80 m. Meereshöhe (Mai 1936 — *L. J. Brass 6817*).

Die Art schliesst sich an *Paralinospadix caudiculatus* an, von der sie sich schon durch die eigentümlichen schmalen, dunkelbraumen Schuppen unterscheidet, mit denen die Kolben, vor allem auch die Aehre zwischen den Früchten und Blütengruppen dicht bedeckt ist.

Sectio II. **Atopocarpus** Burret, sectio nova.

Albumen ruminatum.

Paralinospadix (*Atopocarpus*) **Merrillianus** Burret, spec. nov.

"Caudices plures caespitosi, usque 3–4 m. alti, ad apicem 1.3 cm. diam." Frondis vagina versus apicem tenuiter reticulato-fibrosa, frondis prob. nondum plane adultae petiolus 14 cm. longus, supra inferne excavatus, superne planus, subtus rotundatus, ut rhachis fusco-furfuraceo-lepidotus. Lamina 80 cm., rhachis 62 cm. longa, segmentis utrinsecus 14. Segmenta fere regulariter disposita, directione praeter basilaria haud variantia, basilaria 1–2 angustissima, sat brevia, et sequentia nonnihil breviora atque angustiora, sed omnia praeter apicalia ambo nervo primario unico percursa, leviter lanceolato-lineari-sigmoidea, sed magis ad apicem falcata, longe, tenuissime acuminata, ad basin nervi conspicue curvatis, supra i.s. atra, subtus nonnihil pallidiora, costa media supra quam reliqui nervi multo validior, subtus quam nervi 2–3 ulteriores laterales, dextra sinistra tenuiores, segmenta maxima dimidiae circ. laminae 38 cm. longa, 2.5 cm. circ. lata, segmenta apicalia latiora, nervis primariis pluribus percursa. Spadix simplex, 80 cm. circ. longus. Spatha superior fusco-furfuracea dimidium pedunculum circ. aequans. Pedunculus tenuis, pallide furfuraceo-tomentosus. Spica florifera 30 cm. circ. longa, inter florum glomerulos in eodem modo vestita, paleis angustis (ut in *P. lepidota*) nullis. Florum glomeruli in spira inferne laxiores, superne densissime dispositi, axi sub glomerulis producta, truncata. Flores ♂ pro rata magni, 4 mm. fere longi, ovati. Calyx dimidium perianthium circ. aequans, sepalis ovatis, dorso carinatis. Petala ovata, dorso dense

nervosa. Stamina 8. Antherae lineares, 2 mm. et ultra longae, basi usque ad dimidiam sagittatae, dorso affixae. Pistillodium longitudine staminum, superne leviter incrassatum. Fructus i.s. cum perianthio 1.8 cm. longus, rostratus, 0.8 cm. in diam., niger, sclerosomatibus prominentibus densissime granulosus. Perianthium 0.5 cm. circ. altum. Calyx obliquus, dimidium perianthium circ. altitudine aequans, sepalis late ovatis. Petala basi lata, apice acute triangulari, 3 mm. fere alto imposito. Albumen in sectione transversa ruminationibus circ. 12 tenuibus, simplicibus vel rarius crassiusculis, irregularibus plerumque dimidium radium aequantibus vel vix superantibus.

PAPUA: Fly River, 528 Meilen-Lager, 80 m. Meereshöhe. In Menge auf Bänken an schmalen Flüssen im Wald. Reife Fruchte schwarzpurpurfarben (Mai 1936 — *L. J. Brass 6815*).

Hierzu gehört auch die folgende Pflanze mit ausgewachsenem grösserem Wedel: PAPUA: Fly River, 528 Meilen-Lager, 80 m. Gemein an kleinen Flüssen im Wald, ± 2 m. hoch, 2–3 Stämme, Blätter etwa 2 m. (Mai 1936 — *L. J. Brass 6753*).

Die erste Art des Gattung mit ruminatem Endosperm. Erinnert an *P. caudiculatus* und *P. lepidotus*.

Calyptrocalyx Albertisianus Becc. in Webbia **1**: 305 (1905).

Ptychosperma Normanbyi (non F. v.Muell.) ? Becc. in D'Albertis, New Guinea **2**: 399 (1881).

PAPUA: Unterer Fly River, Ostufer gegenüber Sturt Island. Gemein im Unterwuchs des Regenwaldes im Ueberschwemmungsgebiet, 12–13 m. Höhe. Stamm 9 m. lang, 7.5 cm. in Durchmesser unter den Blättern. Blätter 12, 3.25 m. lang, einschliesslich des freien Blattstiels (40 cm.). Vagina 55 cm. lang. Spadix axillär, 1.80–1.94 m., junge Früchte purpurn (Oktober 1936 — *L. J. Brass 8110*).

Dies dürfte wohl ziemlich sicher *C. Albertisianus* sein. Leider sind von dieser nur reife Früchte beschrieben, während Herr Brass nur junge Früchte angetroffen hat. Der Standort der von *D'Albertis* gesammelten Früchten ist nicht genauer bekannt. Der Kolben besteht aus 3 kollateralen Aesten mit einer gemeinsamen unteren Spatha, während jeder Ast eine eigene cylindrische Spatha besitzt, die den Pedunculus überragt. Die Vagina ist oben in Fasern aufgelöst. Die Rhachis ist unterseits mit einem ± abfälligen, krustig-schuppigen, rotbraunen Ueberzug versehen. Die Fiedern sind anscheinend regelmässig angeordnet, schwertförmig, die grössten vorliegenden sind 78 cm. lang, fast 8 cm. breit, trocken unterseits dunkler als oberseits. Die jungen Früchte sind in einer nicht sehr dichten Spirale angeordnet.

Cyrtostachys microcarpa Burret, spec. nov.

"Caudex 27 m. altus, infra frondes 11.5 cm. in diam." Frondes 10, 3.15 m. longae (petiolo brevissimo). "Vagina ± 1 m. longa, fusco-lepidoto-leprosa, ad apicem lacerata. Petiolus in fragmento viso perbrevis, apicem 4 cm. latus, supra excavatus, marginibus acutis, subtus rotundatus, ut rhachis decidue pallide lepidoto-fusco-furfuraceus. Segmenta infima perangusta, minora, fere linearia, anguste acuminata. Rhacheos fragmenti, ut videtur, superioris segmenta regulariter disposita, lineari-lanceolata, subtus inferne in costa media paleis linearibus in dimidia affixis praedita, 1.15 m. longa, ad basin nonnihil reduplicata, in dimidia circ. usque 4.5 cm. lata, sensim attenuata, breviuscule acuminata, utrinque glabra. Spadicis ramus primarius visus duplicato-ramosus, 1 m. circ. longus. Rami floriferi 70 cm. circ. longi, superne sensim modice attenuati, axi i.s. in dimidia parte 5 mm. in diam. metiente. Foveae densissimae in orthostichis 8–9 dispositae, margine inferiore conspicue, acute producto, axi inter foveas angusta, pilosula. Fructus parvi, cum perianthio i.s. 1 cm. longi, nigri, nitentes, fere cylindrici, in fructu ipso 4 mm., in perianthio 5 mm. in diam., sat sensim rostrati. Perianthium 4.5 mm. altum, badium, cupuliforme. Calyx dimidiam corollam altitudine aequans. Petala latissime rotundata, fere obcordata, apice parvo triangulari imposito. Pericarpium tenue, fibris applanatis, tenuibus, in stratu unico dispositis. Albumen aequabile.

Papua: Mittlerer Fly River, See Daviumbo. Regenwald. Sehr hohe Art, gemein auf Berghängen, häufig die Waldbäume an Höhe überragend (September 1936 — *L. J. Brass 7757*). Typus. — Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Überall in dieser Gegend gemein ausser im Ueberschwemmungsgebiet des Flusses. Sehr hohe Art, so hoch oder höher als die übrigen Waldbäume. Material von einem Individuum, dessen Stamm 28 m. hoch ist und 12 cm. unter den Blättern im Durchmesser hat. Zwölf Blätter, spreizend, ± 4.8 m. lang einschliesslich des 16–20 cm. langen Petiolus. Vagina grün, ± 1.5 m. lang. Rhachis sehr schlank gegen den Scheitel (Juli 1936 — *L. J. Brass 7162*).

Die Fiedern eines Rhachisstückes wohl etwa aus der Mitte des Wedels von n. 7162 sind bis über 1.20 m. lang und 5 cm. breit.

Die Art schliesst sich an *C. Ledermanniana* an mit der sie in dem dichten Gruben der relativ dünnen Aeste, den regelmässig angeordneten Fiedern und den schmalen Früchten übereinstimmt. Es sind jedoch die Früchte mehr gestreckt mit viel schmäleren Schnabel und das Fruchtperianth erreicht nicht die Hälfte der Frücht, während es bei *C. Ledermanniana* länger als die halbe Frucht wird. Der Rand der Gruben ist

an der Basis scharf und deutlich vorgezogen, die erhabenen Teile der Achse zwischen den Gruben sind schmäler und behaart.

Gulubia costata Becc.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Gemein an Uferbänken und Hängen. Hoher Baum. Stamm 27 m. hoch, 15 cm. Durchmesser unter den Wedeln. Wedel 12, spreizend, ± 4.2 m. lang einschliesslich Blattstiel, der 25 cm. misst. Blattscheide 90–95 cm. (Juli 1936 — *L. J. Brass 7245*). — See Daviumbo, Mittlerer Fly River. Gelegentlich im Regenwald, so hoch wie die meisten Waldbäume. Wedel eines alten Exemplars ± 2.5 m. lang einschliesslich Blattstiel, der 20 cm. Frucht dunkelpurpurn mit langen weissen Linien (August 1936 — *L. J. Brass 7591*).

Hydriastele Beccariana Burret in Fedde, Rep. Spec. Nov. **24**: 292 (1928).

H. Wendlendiana Becc. (nec Wendl. et Drude) in Lorentz, Nova Guinea **8**: 206 (1909).

Das Original mit jungen Früchten wurde im südlichen Niederländischen Neuguinea von G. Versteeg (1662) am Monte Resi gesammelt. Nach Beccari wurde die Art schon von d'Albertis am Fly River gesammelt.

PAPUA: Gaima, unterer Fly River (Ost Bank). Massenhaft als Unterholz im Regenwald. Stamm 5–7 m. lang, ± 5 cm. Durchmesser unter den Wedeln (November 1936 — *L. J. Brass 8333*). — See Daviumbu, mittlerer Fly River (August 1936 — *L. J. Brass 7592*).

Hierzu dürfte auch die folgende Pflanze mit jungen Kolben gehören: Oroville Lager, Fly River, 30 Meilen oberhalb d'Albertis Junction. Gemein als Waldunterholz. Schlank, bis ± 12 m. hoch. Material von einem Baum, dessen Stamm 9 m. Höhe und 2.3 cm. Durchmesser unter den Wedeln. Wedel 6, ± 1.8 m. lang (August 1936 — *L. J. Brass 7402*).

Hydriastele lepidota Burret, spec. nov.

Frondis vagina cylindrica, glabra, apice auriculata. Petiolus circ. 17 cm. longus, ut rhachis trichomatibus albis, suborbicularibus, in dimidio circ. affixis, densissimis crustaceo-albidus, trichomatibus delapsis eorum basibus dense fusco-punctatus. Rhachis 77 cm. longa, utrinsecus segmenta 20 vel 21 gerens. Segmenta per greges 3 nonnihil interruptos disposita, gregis infimi 3, medii 8, supremi 10, directione haud vel vix variantia, in grege quoque regulariter inserta, apicalia, quam sequentia pluriplo latiora, costis primariis pluribus, conspicue cuneata, apice transverse denticulato-praemorso, sequentia fere linearia, leviter cuneata,

nervo primario unico, suprema apice transverse praemorsa, inferne sequentia apice in dimidia parte repando vel exciso, superiore et inferiore productis bilobata, segmenta inferiora oblique lobulato-praemorsa, margine superiore tantum producto, segmento unico ad apicem gregis medii inserto costis primariis 3 percurso, 40 cm. longo, ad apicem 4.5 cm. lato, mediis uninerviis circ. 31–35 cm. longis, circ. 1.7–2.7 cm. sub apice latis, leviter cuneatis. Segmenta omnia inter tenuiora, utrinque concoloria, subtus in costa primaria et secundaria inferne paleis badiis, linearilanceolatis in dimidia circ. affixis praedita, oculo fortissime armato punctulis fuscis, sat crebris minutissime lepidota. Spadix parvus, 25 cm. longus, parte basilari caudicem amplectente 2.7 cm. in diam. metiente. Spatharum annuli 2 dense sequentes, inferior 1.5 cm. supra basin situs. Rami primarii circ. 10, inferiores ad basin bifidi, superiores simplices. Rami fructiferi 16–21 cm. longi, tenues, fructibus decussatis. In dimidiis ramis fructus ejusdem orthostichi inter partes aequales circ. 1.3 cm. dissiti. Fructus parvi, subovati, 7–7.5 mm. circ. longi, apice brevi, latiusculo. Perianthium scutellatum, 4 mm. in diam. Calyx dimidiam corollam aequans, sepalis late rotundatis. Petala ejusdem formae. Fructus i.s. obscure longitudinaliter rugoso-costatus. Pericarpium stratu tenui fibris applanatis sat numerosis percursum. Semen globulosum, 4 mm. in diam., albumine homogeneo.

Papua: Tarara, Wassi Kussa River, Western Division (Januar 1937 — *L. J. Brass 8701A*). Typus. — Tarara, Wassi Kussa River, Western Division. Gemein in Uebergangsgesträuch zwischen Savanne und Regenwald. Stamme rasig wachsend, 2.5–3 m. hoch, unter den Wedeln 2–2.5 cm. in Durchmesser. Reife Frucht glatt, rot (Januar 1937 — *L. J. Brass 8701*).

Die Art schliesst sich ziemlich nahe an *H. Wendlandiana* (F. v.Muell.) Wendl. & Drude an. Bei dieser sind die Kolben bedeutend kräftiger, mit zahlreicheren und dickeren Aesten. Die Früchte folgen in geringerem Abstand. Die sehr charakteristichen Schuppen an Blattstiel und Rhachis scheinen zu fehlen oder doch viel geringer entwickelt zu sein.

Gronophyllum (*Eugronophyllum*) **Brassii** Burret, spec. nov.

"Palmae collectae caudex 19 m. altus, 9 cm. diam. ad basin, 4.5 cm. infra frondes metiens, pallide cinereus. Frondes 8, patentes, circ. 1.5 m. longae, incluso petiolo 68 cm. longo. Vagina ± 48 cm. longa." Vagina coriacea, cylindrica, fragmentum visum 50 cm. circ. longum, subglabratum, longitudinaliter dense nonnihil costatum, paleis parvis, fuscis, primo ad marginem longe albido-lacerato-villosis, demum glabratis dense praeditum, superne in petiolum angustatum, margine fibris tenuibus, densis laceratum. Petiolus ipse visus 55 cm. longus, dense, decidue lepidoto-

fusco-furfuraceus, subtus rotundatus, supra anguste canaliculatus. Et rhachis eodem modo decidue induta, utrinsecus segmenta 40 fere gerens. Segmenta basilaria 12 circ. dense subirregulariter congesta, quam inferiora 55 cm. circ. longa, sat angusta, apice oblique acuminata, segmenta sequentia 2 dense juxtapposita a grege basilari descripto spatio 2.5 cm. circ. dissita, dein intervallo 3 cm. superante grex segmentorum 5 sequens, segmentis 18 superioribus spatio 22 cm. longo interjecto laxe, fere regulariter vel paulo irregulariter insertis directione vix variantibus secutus. Segmenta media maxima circ. 62 cm. longa, usque 3 cm. lata, apice transverse lobulato-praemorsa, linearia, superne sequentia sensim breviora, angustiora, praeter apicalia 2-nervia latiora, omnia nervo primario unico percursa, nonnihil bicoloria, i.s. supra viridia, subtus brunnea, textura sat robusta, ad basin anguste reduplicata, marginibus imis subcallosis, praeterea costa marginali cinctus. Costa media subtus inferne paleis badiis linearibus, in dimidia affixis praedita. Spadix florifer 45 cm. longus, scopiformis, simpliciter ramosus. Basis 4.5 cm. longa. Spathae 2, dense approximatae, 50 cm. longae, inter tenuiores, inferior quam secunda robustior. Rami circ. 12, omnes simplices, basilaris tantum bractea spectabili, late triangulari suffultus, reliqui bractea brevi. Rami floriferi rectilineares, glabri, i.s. tuberculati, in dimidio ramo in internodiis i.s. 2.5 mm. vix in diam. Florum glomeruli terni in verticillis alternantibus dispositi. Flores ♀ ejusdem orthostichae inter partes aequales 6.5 mm. dissiti, fecundati, petalis recurvatis 4 mm. alti. Calyx 2 mm. fere altus, sepalis late rotundatis, margine tegentibus, profunde excavatis. Petala in parte inferiore, fere dimidia, late, margine sese tegentia, calycem nonnihil superantia, dein apicibus triangularibus, valvatis, recurvatis, apice sat obtusis, crassis. Gynaecium ovatum, stigmatibus 3 sulcatis. Flores ♂ 7 mm. circ. longi. Sepala lanceolata, subacuta, basi connata. Petala cum calyce stipite interjecto conjuncta, lanceolata, 5 mm. fere longa, apice acuminata. Stamine 6 antheris linearibus, 4 mm. fere longis, apice inermi, rotundato, basi profunde sagittatis, dorso ad basin affixis. Fructus non visi.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe über dem Meer. Hohe, ausnehmend schlanke Unterholzpalme, beschränkt auf flachen, etwas sumpfigen Bergwald (Juni 1936 — *L. J. Brass 7093*).

Verwandtschaftlich kommt nur *G. microcarpum* Scheff. in Frage, von der *G. Brassii* sich schon durch den einfach verzweigten Kolben unterscheidet.

Nengella (*Eunengella*) **gracilis** Burret, spec. nov.

Palma gracilis, 3–4 m. alta, caudicibus pluribus, arundinaceis, inter-

nodiis superioribus 2.5 cm. longis, 6 mm. in diam. Frondis infimae vagina 9 cm. longa, cylindrica, superne sensim leviter dilatata, decidue fusco-lepidoto-furfuracea, anguste costata, apice oblique truncata. Petiolus tenuis, 14 cm. circ. longus, primo paleis albis densissime congestis albo-crustaceus, delapsis eorum basibus fusco-maculatus; lamina parva, circ. 28 cm. longa, segmentis utrinsecus 2, raro tertio interjecto. Rhachis in modo petioli vestita. Segmenta late cuneata, infima ambo dimidiato-rhomboidea, margine exteriore oblique lobulato-acuminato, in margine superiore usque 14 cm. longa, 3 cm. et paulo ultra in diam., nervis primariis 4, apicalia ambo dimidiato-obovato-oblonga, margine superiore 17–18 cm. longa, margine exteriore usque vel etiam infra dimidiam curvatim duplicato-lobato, nervis primariis 9, segmentum interjectum uninervium sat anguste cuneatum. Segmenta utrinque i.s. concoloria, subtus primo inter nervos primarios albo-lepidoto-furfuracea, ibidem demum glabrata. Spadix simplex, parvus, 8 cm. et paulo ultra longus. Fructus in verticillis ternis densissime juxtappositis alternantibus. Fructus cum perianthio 12–13 mm. fere longi, ambitu oblanceolati, apice obtuse, basi acuminati, longitudinaliter dense, valde prominenter costati. Pericarpium transsectum fibris robustis in strato unico dispositis. Semen fere cylindrico-oblongum, albumine aequabili. Fructus inferne angustati. Perianthium laxissime accumbens, petalis curvatulis, porrectis 3 mm. et paululo ultra altum. Calyx corollae fundum paulo superans, fere explanatus, sepalis late ovatis. Petala in dimidia inferiore lata, marginibus sese tegentia, in dimidia superiore anguste triangulariter producta.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, sporadisch im Unterholz des Bergwaldes, 100 m. Meereshöhe (Juni 1936 — *L. J. Brass 7083*).

Eine zierliche Art mit sehr kleinen Wedeln und nur 12–3 Fiedern jederseits, die ziemlich stark verbreitert sind. Der Kolben ist einfach.

Sie ist von den bisher bekannten Arten schon durch die wenigen Fiedern zu unterscheiden. Von den in Notizbl. Bot. Gart. Mus. Berlin **13**: 314 (1936) aufgeführten Arten besitzt n. 1, *N. flabellata,* einfache Wedel, bei n. 2–5 sind die Fiedern zahlreich und schmal, sehr wenig verbreitert, nur bei n. 6, *N. pleurocarpa,* sind sie stark verbreitert, aber viel zahlreicher und die endständigen bilden einen Fächer.

Nengella (*Leptophoenix*) **rhomboidea** Burret, spec. nov.

Palma caudicibus plerumque 2, inaequalibus, 4–6 m. longis, infra frondes 8–10 mm. in diam. metientibus, internodiis superioribus 4 cm. longis, dense fusco-leproso-punctulatis. Vagina longe cylindrica, superne

paleis albidis dense crustaceis, iis delapsis inferne fusco-leproso-punctata. Petiolus circ. 35 cm. longus ut rhachis dense fusco-leproso-punctatus. Lamina 56 cm. longa, utrinsecus segmentis 6. Segmenta apicalia ambo semiflabellum formantia, segmento in quoque latere densissime juxtapposito trapezoideo, uninervio, 12.5 cm. in dimidia longo, 5 cm. ad apicem lato, in margine superiore anguste producto. Segmenta inferne sequentia latissime rhomboidea, maximum medium nervis primariis 3, circ. 20 cm. in dimidia longum, 20 cm. inter apices latum, apice superiore producto, segmentum basilare oblique late rhomboideum, 10 cm. in diam., nervis primariis 4, angulo inferiore rotundato, margine superiore anguste producto, 24 cm. longo. Spadix cernuus, ramis 3, 15 cm. longis. Rami inter tenuiores. Fructus in verticillis alternantibus ternis, spatiis conspicuis inter verticilla interjectis. Fructus cum perianthio 12 mm. fere longi, ambitu fere oblanceolati. Pericarpium fibris tenuibus plurimis percursum. Semen cylindrico-oblongum, 7 mm. longum, ruminationibus sat numerosis dimidium radium superantibus.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River. Sporadisch im Unterwuchs des Bergwaldes, 100 m. Meereshöhe (Juli 1936 — *L. J. Brass 7201*).

Von allen bekannten Arten durch die sehr breit rhombischen Fiedern verschieden.

Ptychosperma Macarthurii H. Wendl.

Zur Zeit bin ich nicht ganz sicher wie diese Art auszulegen ist. Als Typus ist wohl eine in Buitenzorg kultivierte Pflanze anzusehn, die von Lam als *Actinophloeus Macarthurii* beschrieben wurde. Es ist dies wohl die erste gültige Beschreibung. Wendland selbst hat jedenfalls keine Beschreibung der von ihm zuerst benannten Palme gegeben. Ich komme nach auf diese Art zurück.

Die nachstehend zitierten Palmen halte ich für die gleiche Art. Sie ist ausgezeichnet durch einen deutlichen ziemlich langen Blattstiel und ganz regelmässig angeordnete Fiedern, die am oberen Rande deutlich vorgezogen sind. Die Blattscheide ist in der Jugend weissfilzig, sie ist am Ende mit zwei ohrförmigen, linearlanzettlichen Stipularbildungen versehen. Nach älteren Blattscheiden wird der Stamm ziemlich kräftig, der Filz fällt ab. Der Kolben ist mittelgross, doppelt verzweigt, mit nach unten deutlich kantigen Primärästen, von denen die untersten von gut entwickelten Brakteen gestützt werden.

PAPUA: Unterer Fly River, Ostufer gegenüber Sturt Island. Kleine Unterholzpalme, gemein im Regenwald, ein Stamm, 6–12 m. lang, hart, Holz schwarz, reife Frucht fleischig, rot, ± 15 mm. × 10 mm. (Oktober

1936 — *L. J. Brass 7999, 7999A, 7999B, 7999C*). Zur gleichen Art gehört wohl: Davu Island, Western Division, 3–5 m. hoch, Blätter gebogen, 8–10 (März 1936 — *L. J. Brass 6376*).

PTYCHOCOCCUS Becc.

Subgenus **Stolidotococcus** Burret, subgen. nov.

Flores, fructus ut in genere, sed albumen profunde ruminatum.

Von dem Subgenus *Euptychococcus* Burret mit nicht ruminatem Endosperm weicht die Untergattung *Stolidotococcus* nur durch tiefe Rumination des Nährgewebes ab.

Ptychococcus (*Stolidotococcus*) **Archboldianus** Burret, spec. nov.

"Palma circ. 20 m. alta, ligno nigro, specimen collectum caudice 16 m. alto, infra frondes 9 cm. in diam. metiente. Frondes 13, patentes, regulariter pinnatisectae. Lamina 3.75 m. longa, petiolus 15–17 cm. Vagina circ. 80 cm. longa," utrinque, praecipue subtus, furfuraceo-albo-tomentosa. Petiolus ut rhachis inferne supra nonnihil late excavatus, marginibus sat angustis, subtus rotundata vel subtriangulariter rotundata, tomento albo, furfuraceo, mox delapso, demum dense fusco-lepidoto-punctata. Segmenta quoad visa regulariter disposita, directione haud variantia, sed infima, 2 utrinsecus visa spatio ad 24 cm. metiente sequentia, quam media nonnihil angustiora, linearia, 50–60 cm. fere longa, 2.3–4 cm. in dimidia lata, superne sat sensim sed nonnihil angustata, apice oblique lobulato-praemorsa. Rhacheos dimidiae prob. fragmentum triangulare, glabrum vel glabratum, subtus lepidoto-punctatum, segmenta lanceolata, rigida, robusta, supra nitentia, subtus opaca, in costa media paleis anguste linearibus dense lepidota, utrinque glabra, basi sat subito contracta, 75 cm. longa, 10 cm. et ultra in dimidia lata, superne modice attenuata, apice subrotundata, dextra sinistra, extus longius praemorsa et leviter lobulata. Frondis fragmentis apicalis segmenta regulariter disposita, sequentia sensim angustiora, linearia, superne vix attenuata, apicalia ambo circ. 22–23.5 cm. longa, 2.2–3.2 cm. lata, transverse lobulato-praemorsa. "Spadices 3, metrum unum longi, infra frondales." Spadix juvenilis visus: Spathae 2, tenues, extus decidue albido-tomentosae, exterior 35 cm. circ. longa, ambitu oblanceolata, apice robustiore, subito contracto, modice acuminato, interior 50 cm. circ. longa, angustior, acuminata. Pedunculus sat longus, ut rhachis et rami applanatus, decidue cinereo- vel cinnamomeo-tomentosus, duplicato-ramosus. Rami primarii numerosi, bractea latissima, fere nulla, in dimidia tantum leviter triangulari suffulti, ramos secundarios sat numerosos exserentes. Florum glomeruli spiraliter dispositi, 3-flori. Flores ♂

juveniles visi, demum prob. magni, sepala lata tegentia, rotundata, petala ovali-oblonga, robusta. Stamina numerosissima, antherae lineares, basi profunde sagittatae, dorso supra basin affixae. Ramus primarius fructifer visus circ. 50–60 cm. longus, ramis divaricatis, fere glabratis, i.s. rubiginosis. Rami fructiferi majores circ. 20 cm. et ultra longi. Fructus in spira laxa dispositi, i.v. "5 cm. longi, 4 cm. in diam.", i.s. rubiginosis, grosse, irregulariter reticulato-corrugata, 5 cm. longi, usque 3.5 cm. vix in diam., ovato-conico-rostrati, subacuti. Perianthium planiuscule scutellatum, 2.8 cm. in maximum diam., extus venoso-striatum. Petala reniformia, late rotundata, apice parvo, triangulari. Calyx 1.5 cm. in diam., sepalis latissime rotundatis. Staminodia circ. 5, dentiformia vel subdeltoidea. Endocarpium osseum, profunde 5-sulcatum, crista quoque saepe cavata vel partim obtusa. Semen 5-cristatum, lamellis nonnihil productis, compluribus ruminatum.

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Unterstufe des Bergwaldes, nicht sehr häufig (Juni 1936 — *L. J. Brass 7120*). Typus. — Ebenda. Kolben auch im Fruchtstadium im rechten Winkel vom Stamm abstehend, kahl, weiss. Früchte von einem anderen Individuum (Juli 1936 — *L. J. Brass 7218*). Die Früchte sind kaum merklich kürzer als bei 7120. Das Perianth ist dasselbe.

Alle bisher bekannten Arten von *Ptychococcus* gehören zu *Euptychococcus*.

Ptychococcus Archboldianus var. **microchlamys** Burret, var. nov.

"Caudex 12–14 m., frondes circ. decem, 2.5 m. longae", prater magnitudinem minorem, ut videtur, vix diversae. Spadix albus, latior quam longus. Flores ♂ in alabastro subcylindrici, apice fere rotundati, i.s. 1.6 cm. longi. Calyx patelliformis, 4 mm. fere altus, sepalis latissime rotundatis. Petala oblonga, leviter acutiuscula. Stamina numerosissima. Antherae circ. 4 mm. longae, basi profunde sagittatae, dorso supra basin affixae. Pistillodium ad basin leviter incrassatum, ceterum tenue, apice lobulatum, stamina altitudine aequantia vel potius superans. Fructus maturus ruber, i.v. "± 4 cm. longus, 3.5 cm. diam.", i.s. 4.5 cm. longus, 3 cm. et paulo ultra in diam., breviter ovato-conicus, subacutus. Perianthium fructiferum 2.3 cm. in maximum diam. ceterum ut in specimine typico. Endocarpium osseum, 5-sulcatum, cristis 5 leviter sulcatis. Semen 5-sulcatum, cristis 5 sulcatis vel fere truncatis, lamellis profundis et sat profundis nonnihil ruminatum.

PAPUA: Sturt Island, unterer Fly River. Regenwald. Gemein auf Flussbänken. (Oktober 1936 — *L. J. Brass 8166*).

Unterscheidet sich von Typus durch die kleinere Frucht und vor allem durch das erheblich kleinere Perianth der reifen Früchte. Auch sind die Wedel nach den Angaben bedeutend kleiner. Nur bei der Varietät liegen ausgewachsene männliche Blüten vor, sodass ein Vergleich mit den männlichen Blüten des Typus nicht möglich. Um mehr als eine Varietät handelt es sich aber *bestimmt nicht*.

Rhopaloblaste Ledermanniana Becc. in Bot. Jahrb. **58**: 451 (1923).

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Sporadisch im Unterwuchs des Bergwaldes. Schlanke Palme, ± 18 m. erreichend. Stamm schwarz, mit deutlichen Blattringen. Material von einem Exemplar, dessen Stamm 14 m. hoch ist und 6 cm. unter den Blättern im Durchmesser hat. Sieben Blätter, spreizend, ± 3 m. lang einschliesslich des kurzen Blattstiels. Vagina ± 70 cm. lang (Juni 1936 — *L. J. Brass 7135, 7135A*).

Pinanga punicea (Miq.) Merr. Interpr. Rumph. Herb. Amb. 122. (1917) var. **papuana** Becc. sub *Pinanga ternatensis* Scheff. var. *papuana* Becc. Malesia **3**: 116 (1886).

Ptychosperma caudata Becc. Malesia **1**: 55, 96 (1877).
Pinanga caudata Becc. Malesia **1**: 101 (1877), Ann. Jard. Bot. Buit. **2**: 90 (1882).

PAPUA: Fly River, 528 Meilen-Lager, 80 m. Höhe. Gemein im Unterholz der Wälder, mehr oder weniger 12–14 m. Material von einem Baum, dessen Stamm 9 m., 6 spreizende Blätter ± 3.25 m. lang einschliesslich des kurzen Petiolus, Blattscheide ± 85 cm. lang, Kolben gelb, einzeln unter den Blättern. Reife Früchte schwarz (Mai 1936 — *L. J. Brass 6816*). Ebenda, gemein, 10 m., schlanker Stamm, wenige, spreizende Blätter, im freien Teil ± 2.5–2.6 m., einschliesslich des kurzen Petiolus (15 Mai — *L. J. Brass 6611*).

Diese Varietät wurde von Beccari im nördlichen niederländischen Neuguinea bei Andai gesammelt. Die Art stammt von Ternate. Die Pflanzen von Brass stimmen gut mit der Beschreibung von Beccari überein, sodass ich keinen Zweifel habe.

Areca macrocalyx Zipp.

Indem ich hier eine Anzahl Nummern von Herrn Brass zitiere, bin ich mir bewusst, dass es sich um verschiedene Formen und Varietäten handelt. Es scheint mir indessen notwendig, diese sowohl wie auch verschiedene Arten genauer zu untersuchen, die mir zum Teil noch nicht oder wenig bekannt sind. Zum mindestan nahe verwandt sind *A. macrocalyx* Zipp., *jobiensis* Becc., *Warburgiana* Becc., *congesta* Becc. und

Ledermanniana Becc. Beccari hielt *A. macrocalyx* Zipp. fur sehr variabel, besonders in den Früchten wie auch in den Fiedern und ihrer Anordnung. Sehr auffallend ist, dass unter dem Material, des den Namen *A. macrocalyx* trägt, soweit die Blattbasis vorhanden ist, sich Stücke fast ohne Spur eines Petiolus und solche mit deutlichen Petiolus finden, wie dies auch bei n. 7170 der Fall ist. Zur Zeit bin ich nicht in der Lage, der Sache nachzugehn, schon deshalb weil ich kein sicheres Material von *A. macrocalyx* Zipp. und *A. jobiensis* Becc. kenne. Auf der Tafel 160 in Blumes Rumphia ist ein deutlicher Blattstiel erkennbar.

PAPUA: Sturt Island, unterer Fly River, massenhaft im Unterholz im Ueberschwemmungsgebiet des Regenwaldes. Stamm 7-8 (bis 15) m. lang. (Oktober 1936 — *L. J. Brass 8189*). — Mittlerer Fly River, See Daviumbu, reichlich im Regenwald. Stamm 5 6 m. (September 1936 — *L. J. Brass 7901*). Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River. Unterwuchs des Waldes, 100 m. Höhe. Betelnuss-Palme. Stamm 4 m. lang, 3 cm. unter den Blätter im Durchmesser, Blätter sechs, 1.60 -1.65 m., Blattscheide aussen braun, innen rot (August 1936 — *L. J. Brass 7386*). Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River. Sporadisch im Unterholz des Waldes der Hänge, 100 m. Höhe. Stamm 14 m. × 2.5 cm. Blätter 5, spreizend und überhängend, Innenfläche der Blattscheide rot. Betelnuss, von den Eingeborenen benutzt (Juli 1936 — *L. J. Brass 7170*).

Areca nannospadix Burret in Jour. Arnold Arb. **12:** 265 (1931).

PAPUA: Palmer River, 2 Meilen unterhalb der Vereinigung mit dem Black River, 100 m. Höhe. Im Unterwuchs des Waldes, gemein in nassen Niederungen und an niederen tonigen Hängen. Stamm selten über 1.5 m. Blätter fast so lang wie der Stamm (Juni 1936 — *L. J. Brass 7001*).

Es könnte sich höchstens um eine kleinere Varietät handeln. Bei der Beschreibung ist überdies ein Irrtum unterlaufen. Die Wedel sind nicht 3 m., sondern 3 Fuss lang.

Nipa fructicans Wurmb.

PAPUA: Tarara, Wassi Kussa River, Western Division. Dichte Bestände mit Mangrovewäldern wechselend, an Flussufern (Dezember 1936 — *L. J. Brass 8526*).

BOTANISCHES MUSEUM,
BERLIN – DAHLEM.

NEW CYPERACEAE FROM NEW GUINEA[1]

H. Uittien

Mapania Moseleyi Clarke f. **latifolia** forma nov.

Foliis 15–17 mm. latis, longioribus, bracteis involucralibus foliis similibus 85, 65, 45, 25, 5 cm. longis.

Palmer River, 2 miles below junction of the Black River, alt. 100 m., *L. J. Brass 7384,* July 1936. Plentiful in undergrowth in swampy parts of forests.

The leaves are distinctly broader than are those of the type-specimen from the Admiralty Islands, collected by Moseley, which are 10–11 mm. wide. Other specimens from New Guinea: N. E. New Guinea, Sepik Region, *Ledermann 12990* (type of *Mapania Ledermannii* Kükenth.) 6–9 mm.; Rouffaer River, *Docters van Leeuwen no. 10452a* (7 mm.); Cycloop Mountains *Gjellerup 524* (9–11 mm.). There are no stem-leaves and the involucral bracts are longer and broader. However, I do not think the differences important enough to give it a new specific name.

Mapania cuspidata (Miq.) comb. nov.

Lepironia cuspidata Miq. Fl. Ind. Bat. Suppl. 603. 1860.

Mapania petiolata C. B. Clarke var. *cuspidata* Uitt. Recueil Trav. Bot. Néerl. **38**: 282. 1936 (Meded. Bot. Mus. Herb. Univ. Utrecht **32**: 282), cum syn.

Malay Peninsula, Sumatra, Java, Borneo.

Mapania cuspidata var. **petiolata** (C. B. Clarke) comb. nov.

Mapania petiolata C. B. Clarke, Kew Bull. Add. Ser. **8**: 54. 1908; Uitt. op. cit. 290, cum syn.

Palmer River, *L. J. Brass 7382.* Malay Peninsula, Sumatra, Java, Borneo, Philippines, Celebes, and Amboina.

In my consideration of this group in 1936 I accepted *Mapania petiolata* C. B. Clarke (1908) as the proper binomial for this species, recognizing several varieties, among them *Mapania petiolata* C. B. Clarke var. *cuspidata* (Miq.) Uitt. As *Lepironia cuspidata* Miq. (1860) is an older binomial than that proposed by Clarke, it becomes necessary to accept Miquel's specific name in *Mapania* for this particular species. I therefore assign specific status to the form that Miquel described and reduce

[1]Results of the Richard Archbold Expeditions.

Mapania petiolata C. B. Clarke to varietal status. The other varieties recognized by me in 1936 are as follows:

Mapania cuspidata var. **angustifolia** (Uitt.) comb. nov.

Mapania petiolata C. B. Clarke var. *angustifolia* Uitt. op. cit. 282.

Philippines, Celebes, Ternate, Halmaheira, Amboina, Ceram.

Mapania cuspidata var. **pumila** (Uitt.) comb. nov.

Mapania petiolata C. B. Clarke var. *pumila* Uitt. op. cit. 283.

Borneo.

Capitularia foliata Uitt. var. **Archboldii** var. nov.

A forma typica differt spica singula, bracteis brevius aristatis. Nux (forsan immatura) 8–10 mm. longa, paulo infra medium constricta, parte superiore fertili 5–6 mm. longa turgida, 4 mm. lata, interdum bicostata, acutissima et acuminata vel subacuminata, straminea, basi fuscescente, longitudinaliter striata et sulcata, parte basali sterili, 3–4 mm. longa, 2–3 mm. lata, fusca, striolata.

Palmer River, 2 miles below the junction of the Black River. Commonly sporadic on low ridges and in wet hollows between ridges, alt. 100 m., *L. J. Brass 7064,* June 1936. Type specimen of the variety in the Utrecht Herbarium; duplicate of the type (not seen) in the Gray Herbarium. Fruiting specimen, same locality and date, *L. J. Brass 7003.* Abundant as undergrowth in swampy parts of forests. Flowering specimen, Herb. Gray, Utrecht.

The species has been found only once on the Solomon Islands, San Cristobal, also by L. J. Brass (*3045*). The type-specimen is in the Gray Herbarium. It differs from the first described species of the genus, known from Dutch New Guinea, by its leafy stem-bases. The type of the species has 7 spikes and the spikelet bracts end in awns about 0.5 cm. long. The characters of the variety may, however, be due to a poor development. This is the first time that a fruiting specimen of this genus has been found. The longitudinally ridged and grooved fruits, subtended by a large sterile part are so entirely different from those of the genus *Chorisandra,* that they supply a new argument against the suggestion of Mr. Ridley, published in the report of the Wollaston expedition, Trans. Linn. Soc. II. Bot. **9:** 244, that the two genera should be united. See Uittien, Rec. Trav. Bot. Néerl. **33:** 289. 1936 (Meded. Bot. Mus. Herb. Univ. Utrecht **32:** 289).

Mapania Archboldii spec. nov.

E sectione PANDANOSCIRPORUM, *Mapaniae gramineae* Uitt. proxima, sed spiculis floribusque minoribus diversa. Rhizoma crassum lignosum,

6 mm. diametro, radicibus 1.5 mm. crassis. Folia subcoriacea, usque ad 95 cm. longa, 7–8 mm. lata, multinervia, nervo mediano subtus prominente, scabra, glauca, basi brunnescentia, tertia parte basali complicata, apice sensim in acumen longissimum flagelliforme subtriquetrum scaberrimum angustata, marginibus dentibus oculo nudo conspicuis valde scabris. Scapi e rhizomate defoliato rumpentibus, 7–15 cm. longi, basi tenuissimi, 0.5–1 mm. diametientes, squamis nonnullis stramineo-brunneis spatio fere 3 cm. longo absconditi, apice paullo incrassati, 1–2 mm. diametro, spiculam unicam more sectionis gerentes. Spicula jam deflorata, nucigera, 1.5 cm. longa, squamis ovato-lanceolatis acutis subcoriaceis margine submembranaceis multistriatis glaucescentibus 1 cm. longis, squamis superioribus vix tenuioribus 1 cm. longis. Flores deflorati. Nux 8 mm. longa, 2.5–3 mm. diametro, teres, apice acuminato-protracta, basi longius protracta, subacuminata, exocarpio deterso 5.5 mm. longa, ellipsoidea, stipite 1 mm. longo, acutissime apiculata, silicis duritate, plumbi colore.

Palmer River, 2 miles below junction of the Black River, alt. 100 m., *L. J. Brass 7164*, July 1936. Typus in Herb. Ultrajectino (Utrecht); typi duplum in Herb. Gray dicto. Locally abundant in ridge forest undergrowth; achenes black.

Hypolytrum scabrum Uitt. spec. nov.

Hypolytro latifolio proxima, sed omni ex parte gracilior, scapis scaberrimis et foliis subtus purpureo-maculatis diversa. Folia usque ad 65 cm. longa, 8–11 mm. lata, trinervia, quarta parte basali complicata, ceterum flaccida, papyracea, versus apicem marginibus et in nervis valde aspera, supra pallida, nervis binis prominentibus, subtus dense purpureo-maculata. Scapus 40 cm. longus, purpurascens, triqueter, lateribus excavatis, angulis asperrimis. Spiculae florigerae 3–4 mm. longae, 1–1.5 mm. latae, statu sicco luteo-brunneae, fructiferae globulares 4 mm. diametro. Flores generis. Nuces breviter ovoideae, interdum fere globulares, acuminatae, raro subapplanatae vix bicostatae, 2 mm. longae, brunneae, nitentes, longitudinaliter lacunosa.

Fly River, Oroville Camp, *L. J. Brass 7398*. Typus in Herb. Ultrajectino (Utrecht); typi duplum in Herb. Gray dicto. A common plant, sporadic in tufts on the forest floor.

The differences between this and *Hypolytrum latifolium* L. C. Rich., *sensu lato*, are in the scabrous scapes and the leaves beautifully spotted with reddish brown, these being so conspicuous that we consider the New Guinea plant to represent a new species.

DEVENTER,
THE NETHERLANDS.

NEW IXORA SPECIES FROM THE SOLOMON ISLANDS

C. E. B. BREMEKAMP

THE MELANESIAN SPECIES of *Ixora* L. belong partly to the subgenus PHYLLEILEMA Asa Gray, which finds its main development in this area, and partly to PAVETTOPSIS Brem., a section of the subgenus PAVETTOIDES Brem. The subgenus PHYLLEILEMA is easily recognizable by its few-flowered, subcapitate inflorescence enclosed between two large foliar bracts; PAVETTOIDES on the other hand has a corymbose or paniculate inflorescence, sometimes with a few fairly conspicuous bracts at its base, but the latter are never as large as in PHYLLEILEMA, and they are moreover stipular, not foliar. PAVETTOPSIS is the largest and most widespread section of this subgenus: it ranges from the Seychelles to Melanesia. The subsessile, trichotomous corymb, the absence of articulations in the latter's peripheral part, and the naked corolla throat distinguish it from the other sections. The three species from the Solomon Islands which I will presently describe belong to this group.

The species of the Solomon Islands differ rather conspicuously from the species of the Malay Archipelago, with which I have dealt at a former occasion (Bull. Jard. Bot. Buitenz. Sér. III, **14**: 231–234, 314–335. 1937). The latter could be grouped in three series: GLABRISTYLAE, PILOSISTYLAE and ORIENTALES. The species of the Solomon Islands agree in the pilose styles with those belonging to the two last series; from the ORIENTALES, which occupy the region to the west of the Solomon Islands, they differ in the possession of short, but well developed calyx lobes; from all three, however, they are separated by the rather small size of the stipular bracts at the base and at the top of the peduncle, by the opposite position, not only of the branchlets of the first order, but of those of the second order too, and by the arrangement of the flowers in fairly distinct triads. In these characters they agree on the one hand with the section POGONANTHUS Brem., from which they differ however conspicuously in the completely glabrous corolla throat, and on the other hand with the species of the Fijian Islands and probably also with those of New Caledonia. The descriptions of the latter, however, are not sufficiently detailed, and as I had no material for comparison, I am at present unable to decide their position. Two of the three species described below are characterized moreover by the presence of well developed bracteoles at the base of the ovary, and by a two-seeded, but nevertheless nearly globose drupe: in other species the drupe is as a rule

flattened or more or less distinctly didymous when both seeds are developed.

1. **Ixora ysabellae,** sp. nov.; TYPUS: *L. J. Brass 3525* in herb. Arb. Arnold. Forma et glabrescentia foliorum, floribus pedicellatis, haud dense bracteatis, calyce breviter lobato ad *I. myrtifoliam* A. C. Smith vergens, statura minore, foliis longioribus, apice caudato-acuminatis, inflorescentia majore, pedicellis longioribus ab ea satis distincta.

Arbuscula 1.5–2 m. alta, parce ramosa. *Rami* novelli primum complanati et leviter bisulcati, mox teretes tamen, glabri, opaci, 3.5–4 mm. diam., deinde cortice griseo-brunneo vestiti. *Folia* glabra petiolo crasso 4 mm. longo; lamina oblanceolata plerumque circ. 25 cm. longa et 8 cm. lata, apice caudato-acuminata, basi subcordata, coriacea, supra nitidula, sicc. supra badia et subtus ferruginea, margine subrevoluta, costa crassa subtus valde prominente et ibidem distincte carinata, nervis utroque latere costae plerumque 13–15 subtus prominulis, venulis laxe reticulatis subtus colore saturatiore conspicuis. *Stipulae* basi breviter connatae, late triangulares et in aristam vaginae aequilongam exeuntes, 8 mm. longae. *Inflorescentia* foliis magnitudine paulum reductis, 15 cm. longis praecessa, subsessilis, trichotome corymbosa, 4–4.5 cm. alta, 10–11 cm. diam., floribus circ. 200, puberula; pedunculus 3 mm. longus; ramuli infimi et ramuli jugi secundi basi oppositi et subarticulati; ramuli alii subopposite; triades subdistinctae; internodium basale axis 12 mm., internodia basalia ramulorum infimorum 28 mm.; internodia alia peripheriam versus gradatim longitudine decrescentia; pedicelli 1–3 mm.; ramuli infimi foliis rudimentariis lineari-lanceolatis 5 mm. longis quae stipulis normalibus 6 mm. longis connata suffulti; alii bracteis filiformibus quorum infimae interdum stipulis sejunctis munitae et linea elevata connectae, superiores in ramulos pedicellosque interdum alte egredientes; bracteolae basi ovarii insertae lineari-triangulares et ovario paulo breviores. *Flores* ovario calyceque puberulis. *Calyx* ovario aequilongus, tubo 0.3 mm. longo, lobis ovatis acutis 1.2 mm. longis. *Corolla* alba, extus intusque glabra, tubo 9 mm. longo et 1.2 mm. diam., lobis linearibus 7 mm. longis et 1.5 mm. latis, acutis. *Stamina* 6 mm. longa, filamentis glabris 2.5 mm. longis, antheris apiculatis 5 mm. longis. *Stylus* ad medium pilosus, stigmatibus 3 mm. longis comprehensis 14 mm. longus. *Drupa* globosa, rubra, glabra, 7.5 mm. diam., biseminalis, calycis lobis persistentibus haud conspicue coronata.

SOLOMON ISLANDS: Ysabel Island, Tataba, alt. 50 m., in dense rain forest, common, leg. *L. J. Brass 3525,* Jan. 1933 (Arnold Arb.).

In the form of the leaves and of the inflorescence, in the pedicellate, not copiously bracteate flowers, and in the comparatively short calyx

lobes this species resembles *I. myrtifolia* A. C. Smith and *I. maxima* Seem. From the latter it is easily distinguished by its glabrous and much smaller leaves, and from *I. myrtifolia* by its larger leaves and its larger and laxer inflorescence.

2. **Ixora bougainvilliae,** sp. nov.; TYPUS: *S. F. Kajewski 1993* in herb. Arb. Arnold. Ad speciem precedentem et ad *I. myrtifolium* A. C. Smith vergens, sed foliis longius petiolatis, basi acutis an subacutis, stipulis longioribus ab utraque faciliter distinguenda.

Arbor usque ad 20 m. alta. *Rami* novelli profunde bisulcati, papillosiores, opaci, 3.5–4 mm. diam.; vetustiores validiores, cortice griseo opaco vestiti. *Folia* glabra, petiolo crasso 10–17 mm. longo; lamina oblanceolata, 25–40 cm. longa et 7.5–11 cm. lata, apice caudato-acuminata, basi acuta an subacuta, coriacea, utrimque opaca, sicc. olivacea, margine subrevoluta, costa crassa subtus valde prominente et ibidem distincte carinata, nervis utroque latere costae 10–15 supra canaliculatis et subtus prominulis, reticulatione densa utrimque distinguenda. *Stipulae* triangulares, basi breviter connatae, in aristam validam exeuntes, 1 cm. longae. *Inflorescentia* breviter pedunculata, trichotome corymbosa, 4.2 cm. alta et 11 cm. diam., floribus circ. 200, peripheriam versus puberula; pedunculus 6 mm. longus; ramuli infimi basi articulati et sicut ramuli jugi secundi oppositi et patentissimi; ramuli alii haud distincte oppositi; triades plerumque difficiliter distinguendae; internodium basale axis 13 mm.; internodia basalia ramulorum infimorum 27 mm.; internodia alia peripheriam versus gradatim longitudine decrescentia; pedicelli 1–2 mm.; ramuli infimi foliis rudimentariis deciduis stipulas normales parvas i.e. 5 mm. longas exhibentibus suffulti; alii bracteis triangularibus parvis quarum superiores in ramulos pedicellosque egrediuntur; bracteolae basi ovarii insertae, triangulares, ovario subaequilongae. *Flores* ovario calyceque puberulis. *Calyx* ovario aequilongus, tubo 0.2 mm., lobis ovatis 1.0 mm. longis acutis. *Corolla* ignota. *Drupa* depresse globosa, scarlatina, vivo 1 cm. alta et 1.4 cm. diam., sicc. 7 mm. alta et 9 mm. diam., biseminalis, calycis lobis persistentibus haud conspicue coronata.

SOLOMON ISLANDS: Bougainville Island, Koniguru, Buin, alt. 800 m., in rain forest, common, leg. *S. F. Kajewski 1993,* Aug. 1933 (Arnold Arb.).

Vern. name: "katioloba."

By the large size of the leaves this species reminds one of *I. maxima* Seem., from which it differs, however, conspicuously in its glabrousness. From *I. ysabellae* Brem. and *I. myrtifolia* A. C. Smith it is easily distinguished by its habit (it is a large tree) and in the shape and size of the leaves.

3. **Ixora solomonensium**, sp. nov.; TYPUS: *L. J. Brass 2948* in herb. Arb. Arnold. Habitu *I. timorensi* Decn. similior, sed corolla fauce glaberrima faciliter ab ea distinguenda; inter species sectionis PAVETTOPSIS maxime ad *I. elegantem* Gillespie et ad *I. tubifloram* A. C. Smith vergens, ab *I. eleganti* calyce glabro, brevius lobato, ab *I. tubiflora* absentia bracteolarum et corolla multo breviore distinguenda.

Arbor usque ad 15 m. alta. *Rami* novelli subcomplanati, opaci, 2 mm. diam.; veteriores cortice griseo opaco vestiti. *Folia* petiolo canaliculato 10–15 mm. longo; lamina elliptico-oblonga an oblonga, 13–17 cm. longa et 5.7–6.5 cm. lata, apice subacuminata, basi subacuta an subrotundata, subcoriacea, supra nitidula, sicc. supra saturate et subtus dilute olivacea, costa subtus prominente sed haud carinata, nervis utroque latere costae 9–10 subtus prominulis, reticulatione subdensa utrimque distinguenda. *Stipulae* in vaginam cylindricam connatae, parte libera latissime triangulari, breviter aristata, 2 mm. longa. *Inflorescentia* foliis normalibus praecessa, subsessilis, laxe trichotome corymboso-paniculata, glabra, floribus circ. 150; pedunculus 3 mm. longus; ramuli trichotomiae primae et secundae basi articulati; internodium basale axis 6–8 cm., internodia basalia ramulorum infimorum 5–7 cm., internodia alia breviora; pedicelli 3–5 mm.; ramuli infimi foliis lineari-lanceolatis sessilibus 1 cm. longis, a stipulis normalibus connatis suffulti; ramuli jugi secundi bracteis minimis, alii ebracteati; bracteolae nullae. *Flores* glabri. *Calyx* 0.8 mm. altus, ovario paulo brevior, tubo quam lobis late ovato-triangularibus paulo longiore. *Corolla* alba, extus intusque glabra, tubo 5 mm. longo, lobis subobtusis 6.5 mm. longis et 2.5 mm. latis. *Stamina* filamentis 2 mm. longis, antheris apiculatis 5 mm. longis. *Stylus* parte inclusa dense pilosus, stigmatibus 3 mm. longis comprehensis 10 mm. longus. *Drupa* globosa, nigra, leviter bisulcata.

SOLOMON ISLANDS: Ulawa Island, Ulawa, in rain forest, leg. *L. J. Brass 2948*, Oct. 1932 (Arnold Arb., TYPE). San Cristoval Island, Star Harbour, Harbour foreshore, leg. *L. J. Brass 3094*, Oct. 1932 (Arn. Arb.).

This plant resembles *I. timorensis* Decn., but the entirely glabrous corolla throat proves that it belongs to the section PAVETTOPSIS. Its nearest allies are doubtless found among the Fijian species: *I. elegans* Gillespie and *I. tubiflora* A. C. Smith especially come very near to it. The style of the latter has been described as glabrous, but this point deserves further study: a few hairs on the included part may have been overlooked. From *I. elegans* it differs in its glabrous calyx and in the shorter lobes of the latter; from *I. tubiflora* in the much shorter corolla and in the absence of bracteoles.

BOTANICAL MUSEUM, UTRECHT.

NEW RECORDS OF STYRAX AND CASUARINA FROM THE SOLOMON ISLANDS

C. G. G. J. VAN STEENIS

STYRACACEAE

Styrax agrestis (Lour.) G. Don; cf. Van Steenis in Bull. Jard. Bot. Buitenzorg III. **12**: 224. 1932.

SOLOMON ISLANDS: Ysabel Island, common in mountain forest on Mt. Marescott, ca. 1000 m. alt., Dec. 2, 1932, *L. J. Brass 3261*, a slender, small tree, flowers white. — Guadalcanal Island, Vuolo, Mt. Tutive, common in rainforest, growing on top of mountains, ca. 1200 m. alt., April 4, 1931, *S. F. Kajewski 2499*, a small tree, up to 12 m., petals white, stamens cream, fruit 18 × 7 mm., finely hairy, with pointed apex, twig galls present, v.n. "born-borna." BISMARCK ARCHIPELAGO: New Ireland (Neu Mecklenburg), Ugana District, Abhang des Lelet Gebirges, 150 m. alt., Mai 12, 1938, *Father G. Peekel 106*, "Baum 12 m. hoch, Blüten weiss, wächst auch in der Ebene und blüht schon wenn nur 5–6 m. hoch, auf gelbem Lehmboden."

This species was hitherto known from the Indochinese Peninsula, Borneo, Celebes, Moluccas (Ceram) and New Guinea. No representative of the Styracaeae was previously known to occur east of New Guinea.

In Malaysia it occurs mostly at low altitude, the highest recorded ones being 500 m. in Celebes and 700 m. in Ceram. It is noteworthy that in this eastern extension of range the species occurs at higher altitudes, 1000–1200 m.

Recently Hosokawa, Trans. Nat. Hist. Soc. Formosa **28**: 65. 1938, described a new species of *Styrax* from the islet of Korror, Palau, Micronesia, viz. *S. rostratus* Hosokawa. This species he placed in the affinity of *S. Warburgii* Perk., which I have reduced to *S. agrestis* G. Don (Bull. Jard. Bot. Btzg. III. **12**: 224. 1932). Hosokawa's description of the first representative of the family to be recorded from Micronesia, agrees well with that of *S. agrestis* and, although I have not seen any Korror specimen, I am convinced that it must be reduced to the widely distributed *S. agrestis*. Phytogeographically the Palau locality fits well into the area of *Styrax agrestis* G. Don.

CASUARINACEAE

Casuarina sumatrana Jungh. & de Vriese.

Solomon Islands: San Cristoval Island, Hinua-haoro, common in mountain rainforest, growing usually on crests of spurs, ca. 900 m. alt., Sept. 16, 1932, *L. J. Brass 2871,* a tree 20 m. or more, with stout, spreading branches, thin, brown, furrowed, suberose bark, red within, and with very heavy reddish wood. Bark of branches warted. Branchlets stiff, bright green. Young growth yellowish.

I fail to see any differences between this specimen and the rather abundant Malaysian material in the Buitenzorg Herbarium. The species was hitherto known from Sumatra, Borneo, Philippines and Celebes, and probably occurs also in New Guinea.

At the time that the species was described it seemed phytogeographically strange to detect in Sumatra an endemic inland species of a genus principally centering in Australia. As has been shown in numerous cases the absence of collections was the principal cause of this assumed peculiar distribution, and later collections have revealed a much wider range. Now all the Malaysian species of *Casuarina* are connected phytogeographically with the Australian-Papuan districts. *Casuarina equisetifolia* is a widely distributed shore tree, *C. sumatrana* occurs throughout the Archipelago, *C. Rumphiana* is also known from Celebes and the Philippines eastward and is probably identical with *C. nodiflora* Forst. (as I have mentioned in this Journal, **12:** 197. 1931), whereas *C. Junghuhniana* Miq., ranging from eastern Java to Timor, is closely allied to certain Australian species (e.g. *C. stricta*).

A similar case of Australian-Papuan types found in western Malaysia which manifestly represents a continuous distribution is that of the genus *Deplanchea* (cf. Bull. Jard. Bot. Buitenzorg III. **10:** 218. 1928). Representatives of this genus are now known from Sumatra, the Malay Peninsula, Riouw, Banka, Billiton, Borneo, Celebes, New Guinea, Australia and New Caledonia.

's Lands Plantentuin,
Buitenzorg, Java.

TWO NEW SPECIES OF OPPOSITE-LEAVED ILEX FROM BORNEO

E. D. MERRILL

IN STUDYING some of the celastraceous material of the large Clemens collection from Mount Kinabalu, Borneo, my attention was called to the two species considered below, partly because in the distribution of the duplicate sets some of the material had been placed under *Microtropis,* and some merely indicated as possibly representing the Celastraceae. When I went over the material to make further possible sight identifications, preliminary to its distribution into the herbarium, I had added *Ilex* to several of the sheets. Of one species fairly complete material is available, with immature buds, mature and expanded ♂ flowers, immature and mature fruits, and morphologically all characters of the flowers and fruits are those of *Ilex;* yet both species have strictly opposite leaves, a character hitherto unrecorded for the Aquifoliaceae. In this family, and in all the numerous species of *Ilex* that hitherto have been proposed and described, the leaves are strictly alternate, although in a few cases they may be pseudo-verticillate by great shortening of the internodes and the resultant crowding of the upper leaves. Yet in these Bornean species all internodes are greatly elongated, and on all the specimens examined there is not a trace of alternate leaves.

The wood structure of *Ilex oppositifolia* Merr. has been examined by Miss F. L. Freeman, under the supervision of Prof. I. W. Bailey, her report being that the wood structure conforms to *Ilex* in all respects. This is confirmed by a report rendered by Prof. S. J. Record of the Yale Forestry School.

Personally I do not believe that a species or a small group of species, conforming to its congeners in all respects as to floral and fruit morphology and in its wood structure, but differing from the described species within the category in having strictly opposite rather than alternate leaves, is worthy of segregation as a genus or as a section or subgenus, and accordingly the two species involved are here placed in *Ilex.* The standard descriptions of the Aquifoliaceae and of the genus *Ilex* are to be modified by indicating that rarely opposite leaves are found instead of strictly alternate ones.

If any other confirmation of the correctness of my contention that *Ilex* is represented by the two opposite-leaved species described below, I would call attention to an unquestionable species of *Ilex* represented by

Clemens 27877, from Mount Kinabalu, Jan. 7, 1932. This remarkably resembles and strongly suggests the two species here considered, even to the cymose-umbellate few-flowered inflorescences and the shape and texture of its leaves. Here, however, the lower leaves are strictly alternate with internodes up to 2.5 cm. long, while the uppermost ones are subopposite and subverticillate, the uppermost leaves being spaced on the nodes from less than 1 to 3 mm. Both species may belong in Subgenus *Byronia*, Series *Eubryonia*, although Subgenus *Euilex*, Series *Lioprinus*, Section *Excelsae* is not excluded by Loesener's not very definite characterizations.

This study has been based on the several numbers of the Clemens collection preserved in the herbaria of the Arnold Arboretum, the New York Botanical Garden, the Rijks Herbarium, Leiden, the Botanical Garden at Geneva, and the University of California, indicated by AA, Ge, NY, RH, and UC.

Ilex oppositifolia sp. nov.

Arbor glabra, 12–18 m. alta, ramis rigidis, teretibus, pallidis, internodiis 2–10 cm. longis, ramulis in sicco subatris, subteretibus vel leviter compressis, plerumque 2–3 mm. diametro; foliis stricte oppositis, crasse rigide coriaceis, sessilibus, ellipticis vel oblongo-ellipticis, 11–18 cm. longis, 6–11 cm. latis, rotundatis vel breviter acuminatis, basi late rotundatis, subcordatis vel distincte cordatis, interdum semiamplexicaulibus, in sicco supra pallide olivaceis vel brunneo-olivaceis, subtus plerumque brunneis, nervis primariis utrinque 10–12, subtus distinctis, elevatis, arcuato-anastomosantibus, reticulis laxis, elevatis; inflorescentiis cymoso-umbellatis, lateralibus, 3–4 cm. longis, floribus in ramulis paucis subumbellatim dispositis, pedunculo 1.5–2 cm. longo, ramis primariis ad 6 mm. longis; floribus ♂ plerumque 4-meris, rariter 3- vel 5-meris, pallide albido-viridibus, pedicellis 3–4 mm. longis; sepalis late reniformibus, 0.5 mm. longis, 1.5 mm. latis, sub fructu junioribus persistentibus; petalis 4 (rariter 3 vel 5), ellipticis, rotundatis, 3 mm. longis, 2 mm. latis, imbricatis, sub anthesi patulis vel reflexis, basi leviter connatis; filamentis basi corollae adnatis, petalis alternantibus, 2 mm. longis; antheris ovoideis, 1 mm. longis, longitudinaliter 2-valvis; ovarii rudimento conico, rugoso vel subcostulato; fructibus globosis, rubris, in sicco atro-castaneis, laevibus, 5–6 mm. diametro, pyrenis 7 vel 8, 3 mm. longis.

British North Borneo, Mount Kinabalu, Penibukan, *J. & M. S. Clemens 40539*, October 3, 1933 (AA, Ge, UC, RH), *31108*, type (AA, NY) Jan. 16, 1933 (marked as equalling 30968), *31375* (NY), Jan. 24, 1933, and *50318* (AA, Ge, RH, UC), Oct.-Nov., 1933. On forested

ridges altitude 1200 to 1500 m. The holotype is in the herbarium of the Arnold Arboretum.

The specimens were distributed as doubtfully representing a celastraceous plant, and 40539 as a *Microtropis*. In spite of the strictly opposite leaves the species is in all respects an *Ilex*, buds, mature flowers, immature and mature fruits being available for study. In *Ilex*, other than by its opposite leaves, it is sharply differentiated by its large, rigidly coriaceous, sessile, broadly rounded, usually cordate and often semiamplexicaul leaves.

Ilex zygophylla sp. nov.

Frutex circiter 4.5 m. altus, partibus junioribus inflorescentiisque leviter puberulis exceptis glaber; ramis pallidis, glabris, teretibus, internodiis plerumque 1–2 cm. longis, ramulis ultimis subatris, obscure puberulis, circiter 1.5 mm. diametro; foliis stricte oppositis, rigidis, crasse coriaceis, ellipticis, 2–4 cm. longis, 1.2–2.5 cm. latis, utrinque late rotundatis, breviter petiolatis, junioribus utrinque obscure consperseque breviter puberulis, vetustioribus utrinque glaberrimis, margine revolutis, in sicco pallide brunneis, supra nitidis, vel junioribus atro-brunneis; nervis primariis utrinque 4 vel 5, supra obsoletis vel subobsoletis, subtus paullo elevatis, arcuato-anastomosantibus, reticulis obsoletis vel subobsoletis; petiolo crasso, 1.5–3 mm. longo; inflorescentiis lateralibus, in ramulis ultimis cymoso-umbellatis, paucifloris, obscure puberulis, circiter 1.5 cm. longis, in sicco atris vel atro-brunneis, pedunculo ad 1 cm. longo; floribus ♂ 4–5-meris, parvis (immaturis), pedicellis 2–3 mm. longis, puberulis; sepalis reniformibus, late rotundatis, extus obscure puberulis, circiter 0.5 mm. longis, 1 mm. latis; petalis (immaturis) imbricatis, glabris, ellipticis, rotundatis, saltem 2 mm. longis; ovarii rudimento conico, longitudinaliter sulcato.

British North Borneo, Mount Kinabalu, Gurulu Spur at Lobang, *J. & M. S. Clemens 51073* (AA holotype, Ge, RH, UC), December 14, 1933, in the mossy forest, altitude about 2400 m., flowers "purple," distributed as *Microtropis* sp.

Although only staminate flowers are known, and these immature, this species is manifestly congeneric with the preceding one. It differs in its very much smaller, fewer-nerved, shortly but distinctly petioled leaves which are rounded but not cordate at their bases, and in its sparingly puberulent younger parts and inflorescences. Like *Ilex oppositifolia* Merr. this species has strictly opposite leaves with no traces of alternate ones.

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PRELIMINARY NOTES ON ASIATIC–POLYNESIAN SPECIES OF ERYTHRINA

B. A. Krukoff

In the course of my work on the American species of *Erythrina* it has been frequently necessary to consult the Asiatic-Polynesian species of the genus. Related species exist in both hemispheres. Many species have been described on the basis of cultivated plants of unknown origin and their disposition involved a search among the Old World species. Inasmuch as there appears to be no compact treatment of the Asiatic-Polynesian species, it seems desirable to publish at the present time preliminary notes which are designed to tie Asiatic-Polynesian species with the groups that are being treated in my forthcoming paper on the American species. Several species are here reduced to synonymy and one is described as new. I wish to extend my sincere thanks to Dr. A. C. Smith, Dr. E. D. Merrill and Dr. J. H. Barnhart for their helpful suggestions and their criticism of the manuscript.

KEY TO THE SPECIES-GROUPS

Keel petals separate and subequal to wings; seeds red; leaflets stellate-pubescent beneath ..... 1. Variegatae

Keel petals connate; seeds not red; leaflets not stellate-pubescent beneath.

Keel petals subequal to wings; pods seedless and indehiscent in the lower half ..... 2. Subumbrantes

Keel petals conspicuously longer than wings; pods bearing seeds throughout.

Standard long-stipitate, subrotund-rhombic; seeds opaque, umber to blackish with black markings ..... 3. Fuscae

Standard and seeds not as above.

Pods ligneous, not follicular; leaflets not ceriferous beneath ..... 4. Arborescentes

Pods chartaceous, follicular; leaflets ceriferous beneath ..... 5. Suberosae

SYNOPSIS OF THE SPECIES-GROUPS

*Keel petals separate,** subequal or somewhat shorter than wings, much shorter than (usually not more than 3/7 as long as) standard; calyx spathaceous; pods ligneous, slightly or deeply constricted between seeds; seeds

*Characters shown in italics do not occur in other species-groups unless noted.

red, scarlet or pale red; *rachises, pedicels,* and *leaflets* (at least on petiolules and costa beneath when young) *stellate-pubescent.* .....1. VARIEGATAE

Keel petals connate, at sutural margins straight or nearly so, subequal to wings, much shorter than (usually not more than 1/2 as long as) standard; calyx campanulate; *pods flat, seedless and indehiscent in their lower half,* not at all constricted between seeds; seeds dark brown. *2.* SUBUMBRANTES

Keel petals connate, at sutural margins much curved, longer (usually less than 1 1/3 times) than wings, shorter than (usually 1/2 to 2/3 as long as) standard; *standard long-stipitate, subrotund-rhombic;* calyx broadly campanulate; pods ligneous, slightly constricted between seeds; seeds opaque, umber to blackish, with black markings. .....3. FUSCAE

Keel petals connate, at sutural margins straight or nearly so, longer (usually 1 1/3–2 times) than wings, much shorter than (usually not more than 1/2 as long as) standard; calyx campanulate; pods ligneous, slightly constricted between seeds; seeds shiny, black; leaflets not ceriferous beneath. .....4. ARBORESCENTES

Keel petals connate, at sutural margins straight or nearly so, much longer (usually 2 1/2 times or more) than wings, shorter than (usually not more than 4/7 as long as) standard; calyx campanulate (subspathaceous in *E. stricta*); pods *follicular, chartaceous,* not at all or slightly constricted between seeds; seeds isabelline to dark brown or sooty; *leaflets ceriferous on both margins of veinlets beneath* or intricately reticulately ceriferous beneath. .....5. SUBEROSAE

1. VARIEGATAE

1. **Erythrina variegata** L. Herb. Amb. 10. 1754.

1a. **Erythrina variegata** L. var. **orientalis** (L.) Merrill, Interpr. Rumph. Herb. Amb. 276. 1917.

2. **Erythrina Parcellii** Bull, Gard. Chron. II. **2:** 392. 1874.

3. **Erythrina mysorensis** Gamble, Kew Bull. **1919:** 222. 1919.

4. **Erythrina rostrata** Ridl. Fl. Mal. Penins. **1:** 580. 1922.

5. **Erythrina Merrilliana** Krukoff, **sp. nov.**

6. **Erythrina euodiphylla** Hassk. Hort. Bogor. 178. 1858.

7. **Erythrina boninensis** Tuyama, Bot. Mag. Tokyo, **49:** 373. 1935.

8. **Erythrina tahitensis** Nadeaud, Enum. Pl. Tahiti, 80. 1873.

9. **Erythrina sandwicensis** Degener, Fl. Hawaii. **2:** Fam. 169c. 1932.

The first six species listed above appear to be very closely related; a careful study of them is much needed. The doubtful *E. rostrata* may prove to be a synonym, whereas at least *E. mysorensis* may be merely a related variety or a form of the common and widespread *E. variegata* var. *orientalis.*

The rediscovery of the very rare *E. tahitensis* in Tahiti seems to be

essential for ascertaining the nomenclatural status of the Hawaiian plant now known as *E. sandwicensis*. I have seen *Nadeaud 499* (type of *E. tahitensis*), deposited at Geneva. It consists of a single inflorescence with small flower buds, two flowers, one pod, one seed, and no leaflets. From this available material it is impossible to decide whether or not the plant is specifically distinct from the plant native to Hawaii.

Brass 5265 apparently represents a previously undescribed species of the group VARIEGATAE, and it is described here as new. Its unvariegated leaflets distinguish it from *E. variegata* and *E. Parcellii,* the pale red rather than greenish standard from *E. euodiphylla,* supposedly endemic to Bali. From *E. variegata* var. *orientalis,* which is represented in collections available to me by approximately 60 specimens, it is immediately distinguished by its remarkable comparatively small (although 3–5-seeded!) ligneous submoniliform pods, deeply constricted between seeds, completely open and much twisted at maturity. The pods resemble those of unrelated American species such as *E. Berteroana* Urb., *E. Folkersii* Krukoff & Moldenke, and others, and are not at all like the pods of *E. variegata* var. *orientalis* nor of other species of the group. Mature seeds were not available. They are undoubtedly reddish and much smaller than those of *E. variegata* var. *orientalis*. The type of the new species differs from the latter plant in certain other details, such as the narrow standard and the apparently more persistent tomentum of rachises, pedicels, calyces and leaflets. However, these characters as a rule are not reliable in the genus and will have to be verified by additional collections.

Erythrina Merrilliana Krukoff, sp. nov.

Arbor sub anthesi foliata; laminis foliorum concoloribus viridibus (non variegatis!); calyce spathaceo; vexillo elliptico, incarnato (non viridiusculo!); alis carinam longitudine aequantibus; carina 2-petala, petalis alis subconformibus sed paullo latioribus et rotundioribus; legumine parvo ligneo, inter semina multo angustato, maturitate valde contorto, seminibus 3–5; *E. variegatae, E. Parcellii* et *E. euodiphyllae* affinis, characteribus supra enumeratis facile distinguitur.

A large tree, leafy at anthesis; branchlets rather stout, densely pubescent with stellate deciduous hairs on younger parts; petioles 17.5–19.5 cm. long, densely pubescent with stellate hairs, at length glabrescent or glabrous; petiolules 4–6 mm. long, about 1.5 mm. in diam., pubescent as the petioles; leaflet blades chartaceous, densely pubescent, soon glabrescent especially on the upper surface; terminal leaflets broadly ovate-deltoid, 9.5–12 cm. long, 7.8–12 cm. broad, obtuse at apex, truncate to subcordate at base; costa prominulous above, prominent

beneath, the secondary veins 6–7 on each side; rachis about 21 cm. long, densely pubescent with stellate hairs, at length glabrescent at least proximally; pedicels 0.9–1 cm. long, about 1.5 mm. in diam., densely pubescent with stellate hairs; calyx membranaceous, spathaceous, opening almost to the base, the part opposite the cleft truncate and with five long (up to 5 mm.) spur-like teeth, the calyx about 28 mm. long and 11 mm. broad when stretched, pubescent as pedicels; standard pale red (ex Brass), elliptic-oblong, erect, about 6.5 cm. long and 1.5 cm. broad; wings obliquely obovate, 13–16 mm. long, 4.5–6 mm. broad; keel petals separate, obliquely obovate, 12–13 mm. long, 5.5–6.5 mm. broad; stamens subequal to standard; pistil usually slightly longer than stamens, the ovary and gynophore densely pubescent, the style glabrous; fruit pedicels about 12 mm. long and 2 mm. in diam.; old pods ligneous, deeply constricted between seeds (submoniliform), about 10.5 cm. long and 1.3 cm. broad, tapering below into a stipe 1.5–3 cm. long, terminated at apex by a very stiff acumination about 1.5 cm. long, densely pubescent with stellate hairs when young, at length glabrous, 3–5-seeded; mature seeds not seen.

Type: *L. J. Brass 5265,* collected October 14, 1933, in secondary forest on lower slopes, Mafulu, Central Division, British New Guinea, alt. 700 meters, and deposited in the Herbarium of the New York Botanical Garden.

The collector describes the plant as a thick-boled tree, 20 meters tall, with pale red flowers, shining brown channelled bark, and soft yellowish wood.

It is a pleasure to name this species in honor of Dr. E. D. Merrill, who has made a valuable contribution to our knowledge of the genus by straightening out the confused nomenclature of certain Asiatic species.

In the course of my work on the American species, I have noted two species supposedly American which are plainly synonymous with *E. variegata* var. *orientalis*. They are discussed below:

Erythrina variegata L. var. **orientalis** (L.) Merrill.

Erythrina divaricata DC. Prodr. **2**: 414. 1825.
Chirocalyx divaricatus Walp. Flora **36**: 148. 1853.
Corallodendron divaricatum Kuntze, Rev. Gen. 172. 1891.

Erythrina spathacea DC. Prodr. **2**: 412. 1825.
Chirocalyx Candolleanus Walp. Flora **36**: 148. 1853.
Corallodendron spathaceum Kuntze, Rev. Gen. 173. 1891.

Erythrina divaricata was based on one of Sessé & Mociño's plates, and was said to be a Mexican plant. The reference in the original description to "foliolis cordatis acutis" and certain details of leaflets, calyx,

standard, and stamens, as seen from the plate (Calq. Dess. *pl. 256.* 1874), indicate clearly that the species belongs with *E. variegata* var. *orientalis* rather than with *E. velutina* Willd., the only American species of *Erythrina* that has a spathaceous calyx. The actual specimen (*Sessé, Mociño, Castillo* et *Maldonado 3695*) that was available for examination supports the above disposal of *E. divaricata.* Neither *E. velutina* nor *E. variegata* var. *orientalis* are native to Mexico. The plate was obviously drawn from a cultivated plant, probably collected in the West Indies.

Erythrina spathacea was described from a plant from Santo Domingo. I have been able to examine the type, kindly sent to me from Geneva by Dr. B. P. G. Hochreutiner, and it obviously belongs with *E. variegata* var. *orientalis.* The characters which, according to DeCandolle, separate *E. spathacea* from *E. divaricata* and *E. indica* Lam. (= *E. variegata* var. *orientalis*) are of no consequence. *Erythrina variegata* var. *orientalis* is known to have been introduced to the Dominican Republic (Santo Domingo) long ago and to have escaped from cultivation.

In America the group VARIEGATAE is represented by *E. velutina,* one variety and one form. The group is quite distinct from all other American and Asiatic-Polynesian species groups, largely by virtue of its spathaceous calyx and separate and subequal keel petals.

2. SUBUMBRANTES

10. **Erythrina subumbrans** (Hassk.) Merrill, Phil. Jour. Sci. **5**: 113. 1910.

This species occupies an isolated position in the entire genus. Its most unusual pods, seedless and indehiscent in the lower half, are not found elsewhere in the genus, but occur in certain other genera of Leguminosae.

3. FUSCAE

11. **Erythrina fusca** Lour. Fl. Cochinch. 427. 1790.

Erythrina atrosanguinea Ridl. Jour. As. Soc. Straits Branch **59**: 93. 1911.

This common and widespread Asiatic-Polynesian species and the equally common and widespread American *E. glauca* Willd. are closely related. The group is related to the American CRISTAE-GALLI, and appears to be less closely related to the American VERNAE and the Asiatic *Suberosae,* which have quite different follicular chartaceous pods.

In reply to my request for seeds of *E. atrosanguinea,* Dr. R. E. Holttum, Director of Botanic Gardens, Singapore, in his letter of Aug 27, 1937, wrote: "*E. atrosanguinea* Ridl. is *E. fusca* Lour.". *Herb. Bot. Gard. Singapore 348,* distributed as *E. atrosanguinea,* is certainly conspecific

with *E. fusca*. In the original description I find no characters which would distinguish it from the latter species. In his key Ridley refers to the calyx of *E. atrosanguinea* as "cup-shaped, entire" whereas the calyx of *E. ovalifolia* Roxb. (= *E. fusca* Lour.) is described by him as "2-lipped." This character is of no consequence; the calyx of *E. fusca* is often nearly entire at the margin but lacerate just before anthesis, being greatly stretched transversely, and becoming distinctly 2-lipped.

Erythrina Moelebei Viell.; Guill. & Beauv. Ann. Soc. Bot. Lyon **38:** 87. 1914, hyponym.

I have not seen "*60* in herb. Lugd." which is cited by Guillaumin & Beauvisage as the basis for *E. Moelebei*. *Vieillard Herb. de la Nouvelle Calédonie 381* collected at Döebo, Wagap, Gatope, 1861–67, and distributed as "*E. Moëlebei* Vieill." is plainly *E. fusca*.

4. ARBORESCENTES

12. **Erythrina arborescens** Roxb. Fl. Ind. **3:** 256. 1832.

In fruit characters this Indian-Chinese species approaches species of the groups FUSCAE and CRISTAE-GALLI. However, it differs notably in having keel petals thinly membranous with the sutural margins straight or nearly so, rather than thickly membranous with the sutural margins much curved. Its keel petals resemble those of SUBEROSAE, which, however, has follicular chartaceous pods.

A doubtful species, *Erythrina Moori* Tod. (Hort. Bot. Panorm. **2:** 7. *pl. 26*. 1879) was described on the basis of a cultivated plant of unknown origin and said to be probably from India. Examination of the original description and the plate establishes definitely the fact that it is an Asiatic rather than an American or African species. Examination of the type, if it exists, is necessary to check my conclusion that *Erythrina Moori* is probably conspecific with *E. arborescens*.

5. SUBEROSAE

13. **Erythrina suberosa** Roxb. Fl. Ind. **3:** 253. 1832.

14. **Erythrina glabrescens** R. N. Parker, Indian Forester **46:** 647. 1920.

15. **Erythrina microcarpa** Koorders & Valeton, Booms. van Java **2:** 61. 1895.

16. **Erythrina stipitata** Merrill, Phil. Jour. Sci. **5:** 112. 1910.

17. **Erythrina stricta** Roxb. Fl. Ind. **3:** 251. 1832.

18. **Erythrina resupinata** Roxb. Fl. Ind. **3:** 257. 1832.

This group is obviously related to the American VERNAE, the only other group that also has follicular chartaceous pods.

Erythrina stricta somewhat resembles species of the group VARIEGATAE in having a subspathaceous calyx. It is here placed with the SUBEROSAE, to the species of which it is manifestly closely related, on the basis of many other important characters, such as connate keel petals, which are much longer than wings, and follicular chartaceous pods. Its leaflets are ceriferous on both margins of veinlets beneath, as is the case with *E. suberosa* and *E. glabrescens*.

Erythrina resupinata is placed with the group on the basis of a description of its flowers. Its fruits are unknown to me.

The characters that separate *E. glabrescens* from *E. suberosa* seem hardly sufficient to maintain it as a distinct species. Probably it will best be reinstated as a variety under *E. suberosa*.

I find no record of a satisfactory disposal of the doubtful species, *Erythrina bisetosa* Griff. Notul. Pl. Asia. **4:** 441. 1854. The description seems to indicate that it falls into the group SUBEROSAE, but without seeing the type I am not in a position definitely to suggest its affinity.

PREVIOUS ARRANGEMENTS OF ERYTHRINA BY H. HARMS AND J. LOUIS

Of the five groups into which I place the Asiatic-Polynesian species, the group VARIEGATAE would fall into the section CHIROCALYX (Meissn.) as interpreted by Harms in Engl. & Drude, Veg. Erde **9**(3)[1]**:** 656–659. 1915; the other four groups would fall into the section EUERYTHRINA Harv. Harms made a valuable contribution to the knowledge of the genus by conveniently grouping all African species known at that time into four sections, largely on the basis of the nature of the calycinal limb. In considering the entire genus rather than merely the African species, I prefer, however, to group the species into two subgenera as proposed by J. Louis, Bull. Jard. Bot. Brux. **13:** 295–319. 1935, largely on the basis of the nature of the dehiscence of the calyx. I believe that Louis is quite correct in considering that the sections DICHILOCRASPEDON and DILOBOCHILUS were established by Harms on relatively unimportant characters and therefore should not be considered of equal rank with CHIROCALYX and EUERYTHRINA, which were proposed by Harvey, Fl. Cap. **2:** 236. 1861.

In Louis's arrangement, three purely African sections, namely MEROCRASPEDON Louis, DICHILOCRASPEDON Harms, and DILOBOCHILUS

Harms, belong with the subgenus CHIROCALYX. I estimate these sections to contain approximately 14, 4 and 2 species respectively.* In the same subgenus would fall a compact group referred to in this paper as VARIEGATAE, which consists of 9 Asiatic-Polynesian and 1 American species. I have not seen sufficient material of 3 Australian species, namely *E. vespertilio* Benth., *E. phlebocarpa* F. M. Bailey, and *E. insularis* F. M. Bailey. In characters of fruits and in having separate keel petals subequal to wings they are obviously related to VARIEGATAE. Without careful study of complete botanical specimens I cannot suggest their affinity with this group. It is possible that the recently described *E. rotundato-obovata* E. G. Baker will have to be placed in the same group. The author states that it is closely related to *E. indica* Lam. (= *E. variegata* L. var. *orientalis* [L.] Merrill). I have not seen specimens of this interesting species. The subgenus CHIROCALYX in Louis's interpretation, therefore, would consist of approximately 34 species.

With the subgenus EUERYTHRINA, as interpreted by Louis, would have to be placed the groups SUBUMBRANTES, FUSCAE, ARBORESCENTES, and SUBEROSAE, treated in the present paper and containing 1, 2, 1 and 6 species respectively, approximately 11 African species (largely subtropical), and all the American species with the single exception of *E. velutina* Willd. It is noteworthy that of the African species which fall into the subgenus EUERYTHRINA none are closely related to the Asiatic-Polynesian species. They cannot be placed in any of the Asiatic-Polynesian species-groups.

SUPPLEMENTARY NOTE

When this paper was in proof, I received through the courtesy of the officials of the Botanic Museum and Herbarium, Brisbane, the loan of their *Erythrina* material. These collections include the types of F. M. Bailey's species which are not represented in American herbaria.

Erythrina vespertilio Benth. in Mitch. Jour. Trop. Austr. 218. 1848.

This short-boled tree, often from 1 to 3 feet in diameter, is rather common along the coastal areas of southern Queensland and is usually referred to locally as "Grey Corkwood." The numerous collections of the species show extraordinary variations in form of leaflets, to which Bentham (Fl. Austr. **2**: 253. 1864) has already called attention. On the basis of the characters that were discussed by me under "Synopsis of the species-groups," the species falls with the VARIEGATAE.

*My estimate is doubtless conservative. I have not included in it several new species, all related to *E. abyssinica* Lam., which appear to have been segregated on dubious characters by E. G. Baker.

Erythrina insularis F. M. Bailey, Queensl. Agr. Jour. 1: 228. 1897.

The species appears to be known only from two unmounted sheets of the type collection, *F. M. Bailey 29*, Turtle Island, June 1897. These consist of detached leaflets, petioles and fragments of branchlets, and of a single rachis with numerous pods and seeds. The original description covers well the available material. In the absence of flowers, on the basis of scarlet seeds and of stellate pubescence of petiolules, I place the species with the VARIEGATAE. It is noteworthy that its comparatively small ligneous submoniliform pods, which are deeply constricted between seeds and completely open and much twisted at maturity, resemble those of *E. Merrilliana* of the VARIEGATAE and of certain unrelated American species of the HERBACEAE. Its comparatively small scarlet seeds (9.5–11 mm. long and 7–8 mm. broad), with a broad black line extending for approximately 2 mm. toward the chalazal end, also resemble those of certain members of the HERBACEAE.

Erythrina phlebocarpa F. M. Bailey, Queensl. Agr. Jour. 1: 368. 1897.

The type collection, *Frank L. Jardine s.n.*, Newcastle Bay, consists of three unmounted sheets with detached leaflets and petioles, and of one unmounted sheet with a single rachis, one pod and two seeds. With the species I place excellent sheets (in flower) of *C. T. White 9073*, from a tree 15 meters high, with bright deep red flowers, cultivated at the Botanic Gardens, Brisbane, and *C. T. White 10123* (in fruit), from a small tree with very smooth trunk and soft wood, beach on edge of light rain-forest, Hayman Island. The pods and seeds of the species cannot be distinguished from those of the common *E. variegata* var. *orientalis* and they were well covered in the original description. Its keel petals are connate, at sutural margins straight or nearly so, longer (usually less than 1⅓ times) than wings, much shorter than (usually not more than ½ as long as) standard, its calyx is campanulate and its leaflets are not ceriferous beneath. Thus it is obvious that the species cannot be placed with any of the five species-groups treated in my notes on Asiatic-Polynesian species and has to be segregated in a group of its own, which links with the ARBORESCENTES on the basis of flower characters and with the VARIEGATAE on fruit characters. It falls within the subgenus EUERYTHRINA Harv. as this is interpreted by J. Louis. The species is undoubtedly one of the most interesting members of the genus.

NEW YORK BOTANICAL GARDEN,
BRONX PARK, NEW YORK.

NEW PHANEROGAMS FROM MEXICO

IVAN M. JOHNSTON

Tidestromia tenella, sp. nov.

Herba annua tenella, glabrescens, prostrata (in sicco subflavescens); ramulis pluribus dichotome ramosis 5–15 cm. longis ad 1 mm. crassis cum pilis barbellatis albidis sparsissime instructis; internodiis 1–2 cm. longis; foliis oppositis subsucculentis saepissime glaberrimis utrinque cum costa et nervis reticulatis plus minusve conspicue ornatis; foliorum inferiorum lamina elliptica 1–1.5 cm. longa 4–6 mm. lata, medium versus latioribus deinde basim versus in petiolum 1–2 mm. longum contracta, apice acutiuscula; superiorum foliorum lamina elliptico-orbiculari minus quam 5 mm. longa apice obtusa basi subsessili late affixa; floribus albidis glomerulas sessiles densas 3–5-floras in axillis foliorum formantibus; bracteis hyalinis late oblongis ca. 1.6 mm. longis subglabris; bracteolis albidis oblongo-ellipticis subplanis 1.5 mm. longis et 1 mm. latis, extus medium versus pilis barbellatis satis ornatis; lobis perianthii navicularibus acutis ca. 1.5 mm. longis 0.4 mm. latis, extus pilis barbellatis albis 0.4–0.6 mm. longis abundantissime ornatis; staminibus saltem ad medium in cupulam connatis; staminodiis nullis; parte filamentarum libera ad 0.4 mm. longa; antheris elliptico-oblongis 0.5–0.6 mm. longis medio affixis bilocularibus; ovario fere crassiore quam longo uniovulato; stigmate bilobato, lobis late oblongis; fructu maturo ignoto.

MEXICO: road to Mohovano, 13 km. south of Laguna del Rey, Coahuila, locally abundant on a silty desert flat, plant prostrate, succulent, light green, Sept. 21, 1938, *Johnston 7822* (TYPE, Gray Herb.).

In its barbellate, simple, rather than stellate, trichomes and in its light green glabrescent succulent herbage, this species is unique in the genus. It evidently has its closest relative in *T. lanuginosa* (Nutt.) Standley, which is also an annual herb, but differs from that species in its smaller size, prostrate habit as well as in a variety of minor technical details.

Condalia (§ Eucondalia) **viridis,** sp. nov.

Frutex 1–3 m. altus; ramulis divaricatis spinescentibus, juventute minute hispidulis, maturitate glabratis cortice griseo obtectis; foliis viridibus oblanceolatis vel oblanceo-obovatis 4–18 mm. longis 2–6 mm. latis, supra medium latioribus deinde basim versus in petiolum 1–2 mm.

longum gradatim attenuatis, apice obtusis vel rotundis mucronulatis, subtus costa lata et jugis 2–3 venarum latarum perinconspicueque notatis, supra viridibus haud purpurascentibus, juventute sparse puberulentis mox glabrescentibus; stipulis 1 mm. longis triangularibus persistentibus margine ciliolatis; floribus 5-meris axillaribus solitariis vel geminatis glaberrimis; pedicellis 0.5–1 mm. longis; hypanthio patelliformi ca. 1.5 mm. diametro; lobis triangularibus ca. 1.5 mm. longis intus supra medium medio-cristatis; petalis nullis; staminibus infra sinibus calyci affixis ca. 1.2 mm. longis glabris; ovario glaberrimo; stigmate obscure 2-lobato; drupa nigra ca. 5 mm. diametro globosa; nucula ellipsoidea ad 5 mm. longa.

COAHUILA: about 18 km. south of Allende, very spinescent bush 1–1.5 m. tall, fruit black, under acacias in dry stream-way, Aug. 23, 1938, *Johnston 7015* (TYPE, Gray Herb.); 33 km. N.W. of Hacienda La Babia, open valley floor, 1936, *Wynd & Mueller 439* (G). TEXAS: Eagle Pass, Val Verde Co., 1880, *Palmer 164* (G); Eagle Pass, 1882, *Havard 61* (G); Hudspeth County, May 26, 1928, *Cory 1983* (G); between Burro Mesa and Chisos Mts., Brewster Co., shrub 3 m. tall, in gravelly wash, July 1931, *Moore & Steyermark 3402* (G).

Though some of the Texan specimens have been accepted as forms of *C. obovata* Hook., this plant is evidently most closely related to *C. mexicana* Schlecht. From the latter species it differs in its glabrous ovary, calyx, and mature leaves, and in the green rather than reddish brown upper face of the leaves. It occurs in a region north of the known range of *C. mexicana*. From *C. obovata*, a species of central and southern Texas and adjacent Mexico, *C. viridis* differs in its smaller bushy stature, its much smaller leaves, green on both surfaces, and in its more westerly occurrence.

Condalia (§ Eucondalia) **fasciculata**, sp. nov.

Frutex rigidus spinescens 1–2.5 dm. altus subglaber; ramulis divaricatis spinescentibus, juventute pallidis sparse perinconspicue hispidulis maturitate fuscescentibus glabrescentibus; foliis fasciculatis numerosis glaberrimis carnosulis numerosis viridibus 3–9 mm. longis 1–2 mm. latis oblanceolatis, supra medium latioribus deinde basim versus in petiolum 1 mm. longum gradatim attenuatis, supra laevibus nullo modo nervatis purpurascentibus punctulatis, subtus costa lata et nervis (1–2-jugis) latis depressis perinconspicue notatis, apice obtusis vel acutis mucronatis; stipularibus triangularibus 0.7–0.9 mm. longis inconspicue ciliolatis; floribus glaberrimis in axillis foliorum solitariis vel geminatis; pedicellis ca. 0.8 mm. longis; hypanthio patelliformi ca. 1.4 mm. diametro; sepalis

triangularibus 1 mm. longis persistentibus; petalis nullis; staminibus sepalis brevioribus, filamentis ca. 0.5 mm. longis; stigmate obscure bilobato; drupa globosa nigra ca. 5 mm. diametro carnosa nucula ellipsoidea ad 5 mm. longa; seminibus solitariis.

MEXICO: 3 km. south of Cedral, San Luis Potosi, about sink-holes on gypsum plain, bush 1–1.5 m. high, Sept. 11, 1938, *Johnston 7593* (TYPE, Gray Herb.); 63 km. south of Matehuala, San Luis Potosi, about sink-holes on gypsum plain, intricate bush 1 m. tall, fruit black, Sept. 10, 1938, *Johnston 7512* (G); 10 km. south of Sierra Hermosa, Zacatecas, dense rigid bush 1.5–2.5 m. tall, silty plain in thorn-thicket, Sept. 4, 1938, *Johnston 7409* (G).

This species is probably most closely related to *C. spathulata* Gray but differs conspicuously in its short pedicels, its dark green foliage, its indistinct veins and midrib on the lower leaf-surface, its denser habit of growth, and its coarser branches. It occupies a region in Mexico south of its relative. In the Gray Herbarium there is an old collection of this species collected by Parry, no. 111, on the road from "San Luis Potosi to San Antonio, Texas."

Condalia (§ Condaliopsis) **velutina,** sp. nov.

Frutex; ramulis divaricatis spinescentibus dense villosulis griseo-velutinis; foliis obovatis vel ellipticis 6–15 mm. longis 5–10 mm. latis, medium versus vel paullo supra medium latioribus deinde basim versus in petiolum 1–3 mm. longum contractis, apice acutis vel obtusis vel raro rotundis, supra purpurascentibus villosulis vel glabrescentibus, subtus (praesertim juvenilibus) pallidis villosis costa et jugis 3–4 venarum primarium et reticulum venarum secondarium purpureo-tinctis; stipulis cuneato-lanceolatis ca. 2.5 mm. longis adpresse villosis subpersistentibus; floribus villosis in cymulas 2–3-floras dispositis, in alabastro bracteis latis villosis obtectis; cymulis sessilibus in quaque axilla ramulorum saepe 2–3 congestis; pedicellis 1 mm. longis; hypanthio 1.5 mm. diametro, lobis triangularibus ca. 1.2 mm. longis extus dense villosis; petalis 1 mm. longis, apicem versus latioribus (ca. 0.5 mm. latis), apice emarginatis; staminibus 5 basi petalorum affixis et quam eis subaequilongis; ovario dense villoso; drupa ut videtur globosa; nucula 8 mm. longa.

MEXICO: Guanajuato, 1886, "Zargihuil," *A. Duges 35A* (G); Campo Santo de San Sebastian, Villa de Guanajuato, Dec. 1897, *Duges* (TYPE, Gray Herb.); Guanajuato, Nov. 1903, *Duges 33* (G).

Though evidently not closely related to *C. mexicana* Schlecht. and even belonging to a different section of the genus, the proposed species in gross aspect suggest a coarse form of that species. It differs, however, in its

abundant soft indument, peculiar inflorescence, and petaliferous flowers. The flowers are borne 2–3 in subumbellate axillary clusters. These groups of flowers when immature are covered with hairy bracts forming globose buds, 1–2 mm. thick. Several of these pale hairy globose buds are borne in the axil of each leaf. They are unique in the genus.

Frankenia gypsophila, sp. nov.

Planta depressa 2–5 cm. alta 5–17 cm. diametro; radice valida lignosa apice 1–2.5 cm. crassa; ramulis juniperoideis subquadrangularibus usque 1 mm. crassis minute hispidulis numerosis foliosissimis 3–7 cm. longis subsimplicibus vel ascendenter ramosis, e caudice dense congesto vel e caudice fruticuloso prostrato laxe ramoso (ramis usque 8 cm. longis) erumpentibus; internodiis 1–5 cm. longis; foliis subprismaticis 1–3 (saepe ca. 2) mm. longis 0.5–1 mm. latis, latere marginali (praesertim infra medium) ciliolatis alibi glaberrimis, basi subcordatis vel subsagittatis, margine valde revolutis (facie inferiore laminae omnino occulta) ergo perspicue in medio lateris inferioris sulcatis, latere superiore concavis, infra medium cauli vel fasciculo axillari foliorum adpressis; basibus foliorum utriusque jugi plus minusve juxtapositis sed haud connatis; vaginis stipularibus inconspicuis angustissimis ciliolatis; floribus in ramulis terminalibus haud dichasialibus (non raro in axillis ultimis pluribus ramulos fertiles gerentibus et racemum ut videtur formantibus); calycibus 3.5 (maturitate ad 5) mm. longis valde 5-costatis sessilibus basi jugis duobus decussatis foliorum (caulinis similium) obtectis, lobis 5 triangularibus ca. 0.8 mm. longis; petalis 5 albis vel rariter rosaceis quam calyce ad 2 mm. longioribus anguste oblanceolatis 5 mm. longis ad 1 mm. latis (3 mm. infra apicem acutum ligula minuta donatis); staminibus 5 ca. 4 mm. longis infra medium alatis; antheris ca. 0.6 mm. longis; ovario glabro elongato ca. 1.5 mm. longo; stylo 4.5–5 mm. longo in ramos 3 ca. 1.5 mm. longos fisso; stigmatibus obovatis; carpellis 3 angustis ca. 2.5 mm. longis; ovulis 3–6 e placentis basalibus orientibus; seminibus 3–6 minute papillatis late cylindricis 1.2 mm. longis ca. 0.4 mm. crassis; funiculis longis superne refractis.

Mexico: 10 km. north of San Vicente (53 km. north of Cedral), locally common in gypsum-soil, Sept. 12, 1938, *Johnston 7614* (type, Gray Herb.).

A remarkable species belonging to the sect. Basigonia Niedenz. Its crowded thick scale-like leaves and flat branches have produced a juniperoid habit which, while suggestive of certain species of the Mediterranean and Australia, is very different from any known American species. Its nearest relatives appear to be *F. Jamesii* Torr. of Texas, New Mexico

and Colorado, and *F. Palmeri* Wats. of the coasts of northwestern Mexico and adjacent California. These latter are ericoid shrubs with cymose inflorescences and fewer larger non-papillose seeds.

The leaves of *F. gypsophila* are excessively revolute, the inrolled margins of the leaves meeting and completely covering the lower surface. The midrib, accordingly, is completely hidden. Because of their thickish texture and inrolled margins, the leaves appear prismatic, i.e. somewhat 4-sided, and are about half as thick as broad. The leaves are strictly ascending and on their outer and most conspicuous face (morphologically the lower face) there is a deep narrow lineate groove formed by the meeting of the revolute leaf-margins. Practically all the leaves on the main stems and branches bear in their axils short arrested leafy shoots or crowded leaf-fascicles. These axillary short shoots are commonly less than twice the length of the subtending leaf. Those near the ends of the branches, however, may terminate in a solitary flower. When a number of these short upper shoots are floriferous the plant seems to produce a leafy raceme. Such appearance, however, is deceptive since the cymose type of inflorescence dominates in the genus and it is almost certain that the individual terminal flowers of *F. gypsophila* each represent the initial flower in an otherwise suppressed cyme.

The species was observed in only one locality. It was locally common and associated with a number of the species that characterize the gypsum soils of the intermontane plateau of northern Mexico. The soil was heavy and chalky white with gypsum. Only one other American species of the genus, *F. Jamesii,* is known to frequent gypsum soils. The other American species affect saline localities.

Fouquiera Shrevei, sp. nov.

Arbuscula 2–3 m. alta e trunco brevi ramis numerosis stricte ascendentibus subsimplicibus donata; spinis juventute non raro laminiferis, vetustioribus 2–3 cm. longis saepe longioribus quam foliis axillaribus supra subplanis, subtus concavis; foliis oblongo-obovatis vel orbiculari-ellipticis vel latissime obovatis 1–2.5 cm. latis 1.5–3 cm. longis, apice rotundis, basi in petiolum 1–2 mm. longum valde contractis, margine evidenter (ca. 0.3 mm. late) pallide scarioso-marginatis; floribus in racemos breves glomeratos congestis; racemis (rhachi 3–8 mm. longo) densis dorsi-ventraliter compressis 3–12-floris 1–2 cm. longis (quam folio suffultante evidenter brevioribus) ex axillis foliorum superiorum caulis erumpentibus; pedicellis 0–2 mm. longis, bracteolis 2 oblongis donatis; sepalis ovato-orbicularibus ca. 5 mm. longis, pallidis, margine scariosis, apice abrupte cuspidatis; corolla alba; tubo sepalis breviori campanulato 6–7

mm. longo, extus glaberrimo, intus in zona 2–4 mm. infra basim lobi villoso alibi glaberrimo, apice 5–6 mm. crasso, basi 2–3 mm. crasso; lobis recurvatis 6–7 mm. longis 4.5 mm. latis elliptico-oblongis imam ad basim inconspicue sed abrupte constrictis, apice rotundis abrupte acuminatis; staminibus 10 evidenter exsertis; filamentis ad 10 mm. longis infra medium compressis et latioribus, in zona 2–4 mm. supra basim villosis alibi glabris; antheris triangularibus 2.5–3 mm. longis rosaceis, basi 1.5 mm. latis; stylo ca. 9 mm. longo usque ad ca. 4 mm. supra basim simplicibus deinde in lobos flagellatos rosaceos 5 partito; ovario glaberrimo; capsula 3-valvata elongato-ovoidea; valvis 10–13 mm. longis 5–8 mm. latis; seminibus ignotis.

MEXICO: 26 km. south of Laguna del Rey on the road to Mohovano, Coahuila, locally common on a gypsum-flat, Sept. 20, 1938, *Johnston 7815* (TYPE, Gray Herb.).

A very distinct and well-marked species which differs from all known congeners in its very broad scarious-margined leaves, and its very short congested axillary racemes. The only other white-flowered species of *Fouquiera* is *F. Purpusi* Brandeg. of Oaxaca. In the proportions and size of its corollas the new species is very similar to *F. fasciculata* (R. & S.) Nash.

The species is confined to gypsum soils where it is associated with such species as *Petalonyx crenatus* Gray, *Selinocarpus Purpusianus* Hiemerl. etc. After studying the plant at the type-locality various colonies of it were seen as we travelled northward through the rolling country towards Laguna del Rey. About the type-locality *F. splendens* was very common on the rocky slopes and along the base of the hills. About the margins of the gypsum-flat it grew almost side by side with *F. Shrevei*. These two species could be distinguished at a glance. The new species was a smaller sturdier plant with more rigid darker branches. Its leaves are larger and proportionately much broader than those of *F. splendens*. The new species is a very much more resinous plant. Moribund plants secrete an abundance of brown resin in the bark of the trunk. Surprising amounts of this resin may be picked up about the decayed trunk of any dead plant.

The species is probably widely distributed in gypsum soils in the very arid region about Laguna del Rey and is to be expected elsewhere in southwestern Coahuila. There is an old specimen in the Gray Herbarium which represents the species. This was collected by Palmer (no. *2001*) in May 1880 at "San Lorenzo de Laguna, Coahuila." "San Lorenzo de Laguna" is the type-locality for a number of the species which, like *Fouquiera,* are confined to gypsum soils in the region south of Laguna

del Rey. Although this locality has been given as 75 miles southwest of Parras, I am of the opinion that "San Lorenzo de Laguna, Coahuila" may be the same as the "San Lorenzo" of Wislizenus and consequently at the north-base of the range of hills east of Torreon.

It is a pleasure to associate with this remarkable species the name of my collecting-companion, Dr. Forrest Shreve of the Desert Laboratory, Tucson, Arizona. His publications show a sustained interest in this genus and cover many observations on the ecology, distribution and physiology of this interesting group of desert trees. His name is most fittingly associated with this newly discovered species.

Sarcococca Conzattii (Standley), comb. nov.

Buxus Conzattii Standley, Pub. Field Mus., Bot. **11**: 163 (1936).
Sarcococca guatemalensis Johnston, Jour. Arn. Arb. **19**: 121 (1938).

Through the kindness of Mr. C. V. Morton, of Washington, I have learned that the plant which I have described as *Sarcococca guatemalensis* had been previously described from the state of Oaxaca, Mexico, as *Buxus Conzattii*. The Mexican material is incomplete. Fruit being not represented the unexpected generic relations of the plant could not be established.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

NEW FUCHSIAS FROM SOUTHERN PERU

IVAN M. JOHNSTON

Fuchsia platypetala, sp. nov.

Frutex 2–3 m. altus; ramulis ascendentibus, juventute pilis curvatis 0.2–0.3 mm. longis saepe brunneis vestitis, maturitate glabrescentibus cortice brunneo obtectis; foliis oppositis vel alternis graciliter 4–15 mm. longeque petiolatis, lamina lanceolata utroque acuta 2.5–7.5 cm. longa quam petiolo saepe 7-plo longiore 1–2.3 cm. lata paullo infra medium latissima penninervia (nervis 6–10-jugis ascendentibus) pilis plus minusve erectis saepe curvatis 0.1–0.3 mm. longis vix abundantibus vestita, subtus pallidiori, supra viridi et inconspicue nervata, margine denticulata; floribus solitariis vel geminatis e axillis superioribus caulinis orientibus et in racemos foliosos laxos cernuos aggregatis; pedicellis gracilibus quam foliis proximis subaequilongis vel longioribus sub anthesi 2–3.5 cm. longis pendulis pilis paucis ornatis; ovario elongato 8–10 mm. longo 1.5–3 mm. crasso aliquantum hispidulo; hypanthio 4.5–5 mm. longo basi bulboso (3.5–4 mm. crasso) deinde constricto ca. 1 cm. supra basim angustiori (2–3 mm. crasso) deinde apicem versus gradatim ampliato, apice ca. 9 mm. diametro, extus sparse hispidulo, intus ad 1 cm. infra apicem piloso deinde glaberrimo; sepalis 1.5–2 cm. longis cuneatis basim versus 3–4 mm. latis apice attenuatis; petalis 14–16 mm. longis obovatis supra medium saltem 1 cm. latis, apice rotundis vel late obtusis; staminibus glaberrimis 8 inaequalibus, majoribus petalis subaequilongis; antheris oblongis ad 3.5 mm. longis; stylo infra medium piloso stigmate colorato leviter quadrifido coronato.

PERU: Chinchero, dept. Apurimac, along lanes in town, semicultivated but reported as wild nearby, shrub 2–3 m. tall, fl. crimson, "Serafina," 2930 m. alt., Nov. 1, 1935, *James West 3705* (TYPE, Univ. Calif.; ISOTYPE, Gray Herb.); Cuzco, cultivated in gardens, shrub 3 m. tall, 3350 m. alt., April 1927, *F. L. Herrera 1514* (G).

This is an unusually distinct and handsome species. The large and conspicuous petals are described by the collector as "crimson." The dried material, however, shows the petals as having a large, central, oblong, white or yellowish splotch which extends from the base up to beyond the middle. The remaining parts of the petals are crimson. Similar markings are found near the base of the elongate crimson sepals.

Fuchsia tincta, sp. nov.

Frutex 1–1.5 m. altus; ramulis fistulosis compressis cum pilis brevibus abundantibus brunnescentibus septatis villosulis; foliis oppositis conspicue (1–2 cm. longe) petiolatis; lamina ovata membranacea 10–15 cm. longa 7–10 cm. lata (infra medium latioribus), apice acuta vel subacuminata, basi obtusa, margine evidenter denticulata, subtus (nervis conspicuis 10–16-jugis excepta) purpureo-tincta inconspicue villosula, supra viridi opaca minutissime vesiculifera abundanter vel inconspicue villosula; floribus in corymbulis terminalibus laxis paucifloris foliaceo-bracteatis; pedicellis ascendentibus gracillimis 1.5–2 cm. longis villosulis quam bracteis foliaceis longioribus vel brevioribus; ovario 4–5 mm. longo dense villosulo; hypanthio 20–22 mm. longo, basi bulboso 1–1.5 mm. diametro deinde constricto, 5 mm. supra basim angustiore (ca. 0.8 mm. crasso) deinde apicem versus gradatim ampliato, apice 3–4 mm. crasso, extus subglabro, intus in quarta parte superiore glabro ceteris conspicue retrorseque villosis; sepalis ca. 9 mm. longis triangularibus basi ca. 3.8 mm. latis apice acutis; petalis 6–7 mm. longis oblongo-ovatis medium versus 4 mm. latis, apice obtusis mucronatis, quam sepalis evidenter brevioribus; staminibus evidenter inaequalibus, longioribus petalis aequilongis vel brevioribus; stylo infra medium evidenter villosulo ceterum glabro; stigmato late 4-lobulato; fructu submaturo ellipsoideo 7 mm. longo 4.5 mm. crasso sulcato.

PERU: Rio Tambomayo, prov. Paucartambo, dept. Cuzco, undershrub 1–1.5 m. tall, in forest of upper montaña, 1800–2200 m. alt., calyx deep crimson, corolla crimson-scarlet, July 25, 1936, *James West 7092* (TYPE, Univ. Calif.; ISOTYPE, Gray Herb.).

This species is probably most closely related to *F. macrophylla* Johnston and to *F. asperifolia* Krause, of central Peru, but may be readily separated from them by its broader, more herbaceous denticulate leaves which are purplish beneath.

Fuchsia austromontana, sp. nov.

Frutex 3–4 m. altus, laxe ramosus; foliis saepe ternatis; lamina 2.2–5 cm. longa 0.8–2.3 cm. lata ovato-lanceolata vel lanceolata vel non raro plus minusve oblanceolata in venis 4–7-jugis plus minusve villosula ceterum glabrescente paullo infra medium vel supra medium latiore deinde apicem versus in acumen gradatim attenuata, basi acuta, margine denticulata, subtus pallida supra viridi; petiolo 2–4 mm. longo dense villosulo; pedicellis in axillis folii saepe solitariis quam foliis brevioribus 1–2 cm. longis glabratis; ovario glabro vel sparse villosulo cylindrico 6–8 mm. longo 2–2.5 mm. crasso; hypanthio 2.5–4 cm. longo, extus sparse

villoso, intus in tertia parte inferiore villoso ceterum glabro, basi bulboso 3–5 mm. crasso, 1 cm. supra basim angustiore (2.5–3 mm. crasso) deinde apicem versus gradatim ampliato; sepalis lanceolatis 15–17 mm. longis, basi ca. 4 mm. latis; petalis late obovatis 14 mm. longis 11 mm. latis in sicco purpureis apice rotundis quam sepalis 2–4 mm. brevioribus; staminibus inaequalibus, longioribus quam sepalis paullo brevioribus; stylo usque ad basim glabro; fructu ignoto.

PERU (dept. Cuzco, prov. Paucartambo): between Pillahuata and Acanacu, woods of "ceja de la montaña" formation, among shrubs, 2000 m. alt., shrub 3–4 m. tall, flowers brilliant scarlet, large, corolla somewhat lighter shade than calyx, July 26, 1936, *James West 7083* (TYPE, Univ. Calif.; ISOTYPE, Gray Herb.); thickets in valley of paramo above Pillahuata, Cerro de Cusilluyoc, 3000–3300 m., shrub with petals "scarlet-red," May 1925, *Pennell 14110* (G).

In shape, size, and texture the sepals and hypanthium of the present species much suggest those of *F. denticulata* R. & P. The petals, however, are very broad and rounded, rather than elongate and acute as in *F. denticulata*. The petals of both species become purplish when dry. The relations of *F. austromontana* are probably closest, however, with *F. leptopoda* Krause. It differs from that species in its smaller leaves, broad petals, and coarser less slender hypanthium.

Fuchsia chloroloba, sp. nov.

Frutex usque ad 1 m. altus; radice tuberifera; ramis subsimplicibus elongatis; foliis alternatis conspicue (1–4 cm. longe) graciliterque petiolatis superioribus gradatim reductis; lamina carnosula glabrescente lanceolata 5–12 cm. longa 2–3(–4.2) cm. lata, basi rotunda vel acuta, medium versus vel infra medium latiore deinde in acumen asymmetricum gradatim attenuata, margine denticulata vel integra, subtus pallidiore, nervis saepe 6–8-jugis; floribus in ramis virgatis terminalibus et aggregatis vel in axillis superioribus folii solitariis; pedicellis 2–5 cm. longis; ovario 8–12 mm. longo glabro cylindrico 1–2 mm. crasso; hypanthio 4.5–8.5 cm. longo, basi 2.5–5 mm. crasso deinde gradatim contracto (1–1.2 cm. supra basim hypanthii angustissimo et 1–2 mm. crasso) deinde in tubum subcylindricum (7–12 mm. crassum) plus minusve abrupteque expanso, extus glaberrimo, intus usque ad 1 cm. supra basim villoso ceteris glaberrimo; sepalis triangularibus 13–18 mm. longis acutis, basi 5–7 mm. latis; petalis nullis; staminibus inaequalibus, longioribus 4 quam sepalis brevioribus et quam brevioribus ca. 5 mm. longioribus; fructu 2–2.3 cm. longo glaberrimo.

PERÙ (dept. Cuzco, prov. Paucartambo): eastern slopes of Andes

above Cosñipata, 3100 m. alt., flower rose-colored with greenish lobes, April 1914, *Weberbauer 6935* (G); Pillahuata, Cerro de Cusilluyoc, 2200–2400 m., shrub on open rock cliff above river, calyx-tube "scarlet," lobes "courge green," May 1925, *Pennell 13973* (TYPE, Gray Herb.); Rio Tambomayo, between Pillahuata Bridge and head of Tambomayo grade, 1600–2300 m., forest of upper montaña zone, chiefly epiphytic but occasionally terrestrial in humus, almost stemless to a bush 1 m. tall, roots with long clusters of tubers, nearly leafless at this season, flowers pendant with bright scarlet tube and parrot-green lobes, July 1936, *James West 7094* (G).

An apetalous species related to *F. salicifolia* Hemsl. and to the probably synonymous *F. juntasensis* Kuntze. The present species is a larger plant throughout and has green sepals.

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DOS ESPECIES NUEVAS PARA EL NORTE DE CHILE

Carlos Muñoz*

Con dos láminas

Teniendo a nuestro cargo el año 1935, la Ayudantía de la Cátedra de Botánica y Arboricultura Forestal en la Escuela de Agronomía de la Universidad de Chile, y considerando la importancia de visitar el bosque de Fray Jorge, en la Provincia de Coquimbo, solicitamos ayuda financiera, por Oficio al Decano†, para realizar un viaje de estudio a la región, con el propósito de coleccionar material para el Herbario de la Escuela, petición que fué concedida.

Accompañado de nuestro Prof. y amigo Sr. Marcial R. Espinosa B., Jefe de la Sección Botánica del Museo Nacional, y a quien tengo el agrado de dedicar la especie de *Tetragonia*, en reconocimiento a su aporte en el conocimiento florístico de la región que adquirimos de él en el terreno mismo, y las facilidades gentilmente ofrecidas por el Ing-Agr. Sr. Augusto Bravo V., nos trasladamos a la Estancia de Fray Jorge.

Entre el total de nuestra colección que alcanza a más de 250 números, reunidos con el material cercano a las habitaciones de la Estancia, las faldas orientales de los primeros cordones costinos, en la selva misma, y en la desembocadura del río Limarí, encontramos estas dos nuevas especies que tenemos el agrado de presentar como contribución al conocimiento de esta interesante región. Fray Jorge, está considerado como la reserva natural más boreal del territorio, y es un interesante y valioso exponente de un período post-glacial.

Su vegetación típica de la región valdiviana, conservada por condiciones climatéricas especiales, y su situación de aislamiento por la flora xerofítica, compuesta principalmente por un semi-desierto de Cactáceas, hacen de este paraje uno de los fenómenos más interesantes para la fitogeografía mundial.

Es muy grato dejar constancia de la evidente ayuda y gentil asistencia de nuestro Prof. I. M. Johnston, sin cuya valiosa crítica, nada puso ser efectivo en el desarrollo del trabajo.

(*) Trabajo realizado bajo los auspicios de la Fundación John Simon Guggenheim, habiendo sido agraciado con una de las becas latinoamericanas de esta institución para el período 1938-1939.—

(†) Oficio al Decano de la Facultad, en el que hacíamos presente la importancia del conocimiento florístico de la región. Agosto de 1935. Archivo de la Facultad.—

Las ilustraciones fueron efectuadas con las especies tipos, por nuestra amiga Miss Shirley Gale, a quien expresamos nuestros sinceros agradecimientos.

Astragalus limariensis C. Muñoz spec. nov.

Herba erecta, robusta, subfrutescens, adpresse hispido-villosula; caule estriato ascendente; foliis subsessilibus; foliolis oppositis plus minusve linearibus, conduplicatis, acuminatis, viridibus, integerrimis, apice mucronatis; stipulis distinctis recurvatis; pedunculis ascendentibus, bracteis lanceolatis; tubo calycis campanulato, lobis subulatis aequilongo; corolla lutea, vexillo obovato, lato, reflexo, apice obcordato; alis quam carina evidenter longioribus, laminis oblongis apice rotundatis, unguibus linearibus; ovario lanceolato compresso dense adpresseque nigro-villoso; leguminibus papyraceo, inflatis, ovoideis, acutis, evidenter stipitatis; seminibus reniformibus.

Planta erecta de tallo subfrutescente, sencillo, robusto de más o menos 0,50 m. de altura, obcuramente ceniciento-peluda por pelos blanquecinos recostados hacia arriba; el tallo es hueco, estriado de 3–4 mm. de diametro, generalmente de un color vinoso hacia su parte inferior. Hojas cercanamente sesiles de 10–12 pares de hojuelas, miden 5–6 cm. de largo por 3,5–4 cm. de ancho; las hojuelas son enteras, de 1,5–2,5 cm. de largo por 1,8 mm. de ancho, lineares, acuminadas, apartadas de 3–6 mm. entre una pareja y otra. Las cercanas a la inserción miden 2,5 cm. de largo, naciendo el primer par de hojuelas cercanamente a la base del raquis. Son hispídulas en sus dos superficies, presentandose generalmente dobladas a la desecación. Las estípulas son herbaceas, triangulares, agudas, separadas muy claramente, cubiertas por pelos negruzcos hacia su base, miden 3–5 mm. de largo por 1,5–3,5 mm. de ancho. Las flores de color amarillo y pétalos glabros, van agrupadas hacia el tercio superior de los tallos. La inflorescencia es axilar y ascendente con un pedúnculo de 7–10 cm. de largo, llevando la antesis más o menos 12 flores en un racimo de 2–3 cm. de longitud. Brácteas lanceoladas de 1,5 mm. de largo; el estandarte de forma casi aovada, mide 10 mm. de largo por 7 mm. de ancho teniendo el ápice obcordado; las alas son oblongas de 10 mm. de longitud por 3 mm. de ancho, encontrandose esta última dimensión poco más arriba de la mitad superior; su uñuela es linear de 3 mm. de largo; la quilla mide 6 mm. de largo por 2,5 mm. de ancho, y su uñuela poco más ancha que la de las alas, alcanza en longitud a 2,5 mm. El ovario esta densamente cubierto de pelos, aparentando color negro intenso en los primeros estados de desarrollo. El estipe muy largo, mide 5 mm. de longitud, sobresaliendo de los senos del cáliz 2,5 mm., y

sobrepasando los lóbulos de este último. La forma del cáliz es acampanada con un tubo que mide 2 mm. de largo por 2 mm. de ancho, cubierto completamente por pelos negros; sus lóbulos son del mismo largo que el tubo y tienen forma acuneada. La legumbre es hinchada, ovoideo-globosa de 2–3 cm. de largo por 1 cm. de ancho, es erecta, cubierta por pelos negros inconspicuos que se hacen más notables en la sutura superior de la vaina. Tiene color grisaceo, tornandose hacia el extremo verdosa, para terminar en un estilo persistente de 2 mm. de largo, de color amarillo dorado. No lleva tabique transversal. Los racimos terminales llevan hasta 10 frutos, de los cuales solamente 4–5 llegan a la completa madurez. Su pedúnculo cubierto también de pelos negros, mide 6 mm., llevando generalmente 2 bracteolas en su mitad superior, permaneciendo ascendente. La semilla es reniforme, de color rojo-parduzco, de 1,5 mm. de largo y estan sostenidas por filamentos amarillentos de 1,5 mm. de longitud. Numerosas.

Habita el Departamento de Ovalle, en la Provincia de Coquimbo, Chile. En la región el vulgo la denomina "Tetilla" por la forma de su frutos, que en cierto estado de madurez, cuando se comprimen producen un ruido especial. *Carlos Muñoz N°2,* Fray Jorge 26–IX–1935. Ejemplar tipo en el Gray Herbarium. En el Museo Nacional de Historia de Santiago, el cotipo de la especie. *C. Muñoz B-94,* Fray Jorge, 26–IX–1935, en los lomajes cercanos a las casas de la Estancia.

Esta especie bien característica del grupo *Phaca,* esta cercanamente relacionada con *Astragalus verticillatus* (Ph.) Reiche, con el que se asemeja en su hábito general, en la distribución de su inflorescencia, en sus vellocidades y en la forma de sus flores, pero difiere por estar sus hojuelas ternadas o cuaternadas en el mismo punto, por tener un fruto cartáceo, duro, mucho más pequeño, cercanamente esférico y casi sesil. Por su estipe largo, queda tambien relacionada a *A. Edmonstonei* (Hook. & Arn.) Robinson (*), del que difiere por su aspecto general, por sus hojas planas más vellosas, por la falta de los apendices negruzcos en sus organos florales y estípulas, por sus flores bicolores, y por tener el fruto su máxima dimensión en la mitad superior y ser obtuso en su ápice.

Tenemos también un ejemplar colectado por el Prof. V. M. Baeza, Ovalle al poniente, 19–ix–1917, que difiere del tipo, en la forma del habito y por tener sus hojas y foliolas más reducidas y agrupadas. Según Baeza, la planta es llamada en la región "Hierba loca," como otras tantas especies de *Astragalus.*

(*) De acuerdo con las Reglas de Nomenclatura Botánica, este es el nombre correcto, para nuestra conocida especie de *Astragalus flavus* (Hook. & Arn.) Reiche, según I. M. Johnston, en Jour. Arnold Arb. **19**: 95-96 (1938).

Astragalus verticillatus se encuentra distribuído a lo largo de la Cordillera de la Costa, entre Talca y Concepción, *A. Edmonstonei* (Hook. & Arn.) Robinson habita cerca del mar en Chile central, entre Aconcagua (Quintero) y Constitución, mientras que nuestra planta, en cambio, crece en las colinas bajas, detrás de los primeros cordones en la costa, sobre 200 kilómetros más al norte.

Tetragonia Espinosae C. Muñoz, spec. nov.

Annua herbacea gracilis flavovirens omnibus partibus papillosa, radice albo simplicissimo; caule erecto, plus minusve ramoso, ramis ascendentibus, infimis robustis decumbentibus quam superioribus valde longioribus; foliis basalibus oppositis ceteris alternis, oblanceolatis obtusis sessilibus herbaceis conspicue uninervatis, margine integerrimis basi attenuatis; floribus axillaribus solitariis hermaphroditis tetrameris, sepalis triangularibus, extus et margine vesiculosis intus subglabris; staminibus 4, exsertis, omnino glabris; stigmatibus gracilibus recurvatis; stylo basi vesiculatis onusto; fructibus prismaticis tuberculatis, acutis, glaucis vel viridibus pedunculis longis; ovario 4-loculari, seminibus 4.

Planta anual de 3–6 cm. de altura con la raíz simple, blanca y de 1–2 mm. de grueso; el tallo es erecto y más o menos ramificado, con las ramas ascendientes; los ramos inferiores más robustos que los otros y más largos, de 8–12 cm. de longitud y llevando generalmente todas las hojas y frutos solamente en su mitad superior. Toda la planta es papilosa. El grosor de los tallos varía entre 1–2,5 mm., llevando esta última dimensión solo los laterales inferiores. Las hojas radicales están generalmente secas en la época de floración, son opuestas, oblanceoladas, las superiores alternas; las primeras de 3–4 cm. de largo por 3–18 mm. de ancho, las superiores de 1,5–3 cm. de largo por 6–8 mm. de ancho, medidas en el segundo tercio superior. Son alternas atenuadas hacia la base; las inferiores se ensanchan y casi abrazan las ramificaciones del tallo, midiendo allí 5 mm. de ancho y tornándose de un color pálido. Todas son uninerviadas. Las flores son inconspicuas, solitarias y axilares, generalmente agrupadas hacia el extremo de las ramas. Los 4 sépalos que son de forma triangular y muy papilosos por fuera, miden 2 mm. de base y altura, estando unidos abajo formando un tubo de 2 mm. de profundidad. Los estambres en número de 4, están distribuídos separadamente y sus filamentos alcanzan 1 mm., naciendo a 0,3 mm. del seno de los sépalos; la antera mide 0,5 mm. y es flava. El receptáculo es convexo y muy vesiculoso en el ápice, que es obtuso con 4 estilos filiformes y encorvados. Los frutos están sostenidos por pedúnculos de 1 cm., teniendo algunas veces los basales 1,5–2 cm. de longitud; llevan a menudo a 0,5

ASTRAGALUS LIMARIENSIS Muñoz

FULL-TONE — MERIDEN

TETRAGONIA ESPINOSAE Muñoz

FULL-TONE — MERIDEN

cm. de su inserción 2–3 bracteolas caducas, de 1 mm. de largo y lanceoladas. Son secos, indehicentes y prismáticos, y están provistos de 4 aristas que llevan entremedio 4 tuberculos muy sobresalientes e irregulares que se pierden antes de alcanzar la mitad superior. Los frutos son de color glauco o verdoso, miden 5 mm. en su base más ancha y 4 mm. de altura con el ápice provisto de 4 escamas amarillentas y notables. Lleva 4 celdas, cada una con una semilla.

Sobre suelos arenosos cercanos al mar, en el lado norte de la desembocadura del río Limarí, Departamento de Ovalle, Prov. de Coquimbo, *C. Muñoz, B-212,* Fray Jorge, 26 Septiembre, 1935, Departamento de Ovalle, 30° 40′ lat. Tipo, en el Gray Herbarium y cotipo en el Museo Nacional de Historia Natural en Santiago de Chile.

Esta especie se relaciona con *Tetragonia macrocarpa* Phil., de la que difiere por la forma y tamaño del fruto, y por el mayor número de estambres, a *T. copiapina* Phil., con que también se asemeja, por no ser vellosa, por la forma y tamaño de las hojas y por ser el fruto cuadrilocular.

EXPLICACION DE LAS LAMINAS

Lamina I. **Astragalus limariensis** spec. nov. (1) Hábito ×½. (2) Estípulas ×2. (3) Flor ×2. (4) Estandarte ×2. (5) Ala ×2. (6) Quilla ×2. (7) Fruto, pedúnculo, caliz y estipe ×1. (8) Sección transversal del fruto ×1. (9) Semilla ×7.5.

Lamina II. **Tetragonia Espinosae** spec. nov. (1) Hábito ×⅔. (2) Flor ×4.5. (3) Semilla ×7.5. (4) Semilla, sección transversal ×7.5. (5) Fruto ×4.5. (6) Sección transversal del fruto ×4.5.

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CLYMENIA AND BURKILLANTHUS, NEW GENERA ALSO THREE NEW SPECIES OF PLEIOSPERMIUM (RUTACEAE–AURANTIOIDEAE)

WALTER T. SWINGLE

With three plates

IN CONNECTION with the preparation of a synopsis of the genera and species of the Orange Subfamily, AURANTIOIDEAE, that I have had under way for the past few years, a number of new species and a few new genera have come to light.

The striking new genera and new species here described show several new types of pulp-vesicles that throw much light on the origin and development of these remarkable organs peculiar to the subtribe CITRINAE to which belong *Citrus* and the genera most closely related to it.

Attention has recently been directed to a very peculiar *Citrus* species commonly cultivated in New Ireland, an island about 360 miles northeast of New Guinea in the Bismarck Archipelago. It is called "a mulis" by the natives who eat the sweet fruits. Prof. T. Tanaka studied a herbarium specimen of this plant in the herbarium of the Botanical Museum at Berlin-Dahlem which was collected by Peekel, no. 408[1] at Nukonuko, Namatanai, in New Ireland in 1910. In 1928, Tanaka published a new species, *Citrus polyandra* Tanaka, based on this specimen. He considered his new species as probably being a hybrid of the citron, *C. medica,* with the native bitter orange, *C. macroptera,* common in New Guinea and the western Polynesian Islands.

Upon examining a photograph of the type specimen, furnished me by Prof. Tanaka, I was struck by the fact that the leaves of *C. polyandra* are very unlike those of either of the supposed parent species in having very short wingless petioles, not articulated with the leafblades. Inasmuch as *C. macroptera* has very long, broadly winged petioles, sometimes nearly equalling the leafblade in area, it seems improbable that this species could be one parent of *C. polyandra,* especially since hybrids often found in the Philippines, between the commonly cultivated species of *Citrus* and *C. macroptera,* or related species belonging to the same group of *Citrus* (the subgenus *Papeda* with broadly winged petioles), always have petioles with wings intermediate in width between those of

[1]Tanaka, Tyozaburo, On certain new species of *Citrus* (in Studia Citrologia, Kankitsu Kenkyu, 2: 158-159 [Japanese], 163-164 [English and Latin]. Nov. 1928).

the two parental species. I was also impressed with the fact that the leaves of *C. polyandra* show a remarkable resemblance to those of *Monanthocitrus cornuta* (Lauterbach) Tanaka, a *Citrus* relative native to New Guinea, but differing widely in other respects from *C. polyandra*. Thanks to the kindness of Dr. L. Diels, Director of the Botanisches Museum at Berlin-Dahlem, I have been able to make a critical examination of the leaves, flowers and fruits of *C. polyandra*. In the course of this study the only remaining flower bud on the unique type specimen was restored by a modification of Juel's method[1], then imbedded and cut into serial sections. The bud, after imbedding, was first cut into longitudinal serial sections as far as the axis, then turned at right-angles and cut completely into numerous transverse serial sections. (Plate 1, figure 2.) These two sets of serial sections revealed characters very unlike those of *Citrus*, particularly in the androecium.

A section of dried fruit from the type specimen was also restored and cut into serial sections which showed that the pulp-vesicles, highly specialized structures found only in the subtribe CITRINAE, differ decidedly in structure and still more strikingly in their mode of attachment, from those of any other plants of this tribe. Convinced by the study of this material that the plant from New Ireland was a striking new type of Citrus Fruit Trees, I wrote to Prof. Cyril T. White, F. L. S., Government Botanist of Queensland, Brisbane, Australia, requesting him to secure, if possible, more material for me. Through his good offices, the hearty cooperation of the Agricultural officers of the Mandate of New Guinea (of which New Ireland is a part) was secured and in May, 1937, Mr. G. S. Gee, with the help of Brother Peekel, who collected the type specimen of *Citrus polyandra* Tanaka, secured for me excellent material preserved in formaldehyde solution, showing flowering and fruiting twigs, mature leaves and ripe fruits. (Plate 1, figures 3, 4, 5.) A thorough study of this material proves that this plant constitutes a new genus closely allied to *Citrus* yet differing in many very important characters; for this genus I propose the name *Clymenia*.

Clymenia[2] gen. nov.

Clymenia, genus *Citro* affine sed differt vesiculis pulpiferis pyriformi-

[1]See Swingle, Walter T., New methods of restoring material in a study of Citrus and related genera. (in Jour. Wash. Acad. Sci. 29: 218. 1939). In this work I have had the skilled assistance of Dr. Albert H. Tillson.

[2]From the Greek Κλυμενη, a mythological Greek character, sometimes said to be the mother of Atalanta (for whom Correa da Serra named the genus *Atalantia*, a rather close relative of *Citrus*), but more often held to be either the daughter of the Titan, Oceanus, and mother of Atlas or else a consort of Jupiter and mother of the ill-fated Phaeton (see Bulfinch, Thos., Age of Fable, ed. E. E. Hale, pp. 49, 457, 467. 1881.)

bus, sessilibus, non solum ad parietes dorsales loculorum fructus sed etiam numerosissimis ad parietes laterales (⅔–¾ distantibus a centro) colligatis; staminibus numerosissimis (quindecies vel viginties quam petalis), liberis, in androphoro truncato-conico latiore quam ovario dispositis; stylo crasso, brevissimo, haud tam longo quam dimidio ovario; foliis simplicibus, petiolis brevissimis cum lamina non articulatis; nervis lateralibus numerosissimis, subparallelis.

Arbor parva, ramis inermibus, ramulis subangularibus; foliis simplicibus, nervis lateralibus numerosissimis (utrinque 20–30), petiolis brevissimis (quindecies vel decies brevioribus quam lamina folii); floribus solitariis in axillis foliorum nascentibus; pedicellis crassioribus et paulo longioribus quam petiolis foliorum subtendentium; disco parvo; filamentis liberis, filiformibus; ovario ovoideo, loculis 14–16, ovulis 4, uniseriatim in quoque loculo, stigmate depresso-capitato; fructibus ovoideis, fructu *Citri* similibus, cortice glandulis oleiferis punctato; seminibus numerosis, magnitudine seminis *C. Limon,* embryone unico.

TYPE SPECIES: *Citrus polyandra,* Tanaka in Studia Citrologica, **2:** 163 (1928).

DISTRIBUTION: Known only from the type locality at Namatanai, New Ireland, Bismarck Archipelago.

This genus strongly resembles *Citrus* in its general aspect, but differs very strikingly in having simple leaves with more numerous, subparallel lateral veins (20–30 pairs, but not all equally prominent); completely wingless, very short petioles (less than 1/10 as long as the leaf-blade); very numerous stamens (15–20 times as many as petals) borne in many rows on a truncate-conical androphore broader than the ovary; hypermerous ovary (14–16 locules), short style (about ½ as long as the ovary), depressed capitate stigma; ovoid fruit, with very numerous short, broad, pyriform, sessile pulp-vesicles having the apex broadly rounded, attached both to the dorsal locule walls and to the radial walls for ⅔–¾ of the distance from dorsal wall to the axile angle of the locule.

The most striking character exhibited by this genus is its huge, broad, cork-shaped androphore that subtends the ovary and obviously exceeds it in diameter (Plate 1, figure 3). This androphore is not the disk, as Tanaka supposed, but the greatly swollen, truncate-conical, stamen-bearing portion of the floral axis.

Although *Clymenia* is obviously closely related to *Citrus* and the other genera of the True Citrous Fruit Tree Group (*Microcitrus, Poncirus, Fortunella* and *Eremocitrus*) it is clearly distinct from any of them. Its nearest analogue in the genus *Citrus* is found among the bitter oranges belonging to the subgenus *Papeda* which also often has fruits with pulp-vesicles

attached to the outer portions of the radial walls of the locules. However, the bitter oranges have very long, very broadly winged, clearly articulated petioles and the leafblades do not show numerous subparallel lateral veins.

Possibly the nearest relative of *Clymenia* is the anomalous *Microcitrus inodora* (Bail.) Swingle, indigenous to northern Queensland, which also has rather large, simple leaves with very numerous parallel lateral veins and very short, wingless petioles and very numerous (over 30) free stamens. However, *M. inodora* has slender-stalked pulp-vesicles like all the other species of *Microcitrus,* an ovary with only 8 locules and abundant spines, often paired. The leaves of *Clymenia* show a number of remarkably close resemblances to those of *Monanthocitrus* and *Wenzelia,* two genera of the Minor Citroid Fruit Trees (subtribe TRIPHASIINAE), usually considered rather distantly related to *Citrus.*

Clymenia may prove on close study of living material to represent a side-line of evolutionary development parallel to, but not in, the main line of descent of the True Citrous Fruit Tree Group. Only one species is known:

Clymenia polyandra (Tanaka) Swingle, comb. nov. PLATE 1

Citrus polyandra Tanaka in Studia Citrolog. **2**: 163, [Japanese] pp. 160–162. 1928.

Citrus medica subsp. *Limonum* var. *Limetta* sensu Lauterbach in Bot. Jahrb. **55**: 264. 1918, non (Risso) Engl.

Twigs angular when young, glabrous, fruiting branches spineless (young plants possibly spiny); leaves simple, large, 12–18 × 4–6.5 cm., oblong-elliptical, more or less caudate-acuminate at the tip (acumen narrow, abruptly rounded), cuneate-attenuate at the base, subcoriaceous, glabrous, lateral veins subparallel, numerous (20–30 pairs), varying in visibility, about half of them easily seen and felt (only these stronger veins visible on upper surface), arising at an angle of 55–65° with the midrib, margins minutely crenulate-serrate; petioles slender, wingless, very short, 6–12 × 2–2.5 mm., flattened on upper side and narrowly margined for a short distance at the tip where the leaf margins are slightly decurrent; flowers borne singly or in few-flowered cymose fascicles in the leaf axils; pedicels more or less angled, usually slightly longer than the petioles on mature flowers, 10–12 mm. long, merging into the calyx and 3.5–4 mm. wide at the top, tapering to 2–2.5 mm. diam. at base; calyx 5-lobed, lobes very thick, rugose without, subtriangular; corolla imbricate (not seen except in the bud); disk inconspicuous, stamens very numerous, in several series, borne on a large truncate-conical androphore wider than the ovary; ovary truncate-conoidal, 3 mm. wide at

base, 2.5 mm. at top, 3 mm. high with 14–16 locules, each with 4 uniseriate ovules; style short (2 mm. long with stigma) 1.3–1.5 mm. wide, not merging into the ovary; stigma depressed-capitate, slightly broader than the style; fruits pyriform or subglobose, slightly mamillate at attached end, 6–8 × 5–6 cm.; pulp-vesicles attached as described above under the genus, ovoid, pyriform, 3–4 mm. high, 2–3 mm. wide, narrowed below to only ⅓ or ½ of the maximum diam. where attached, but not slender-stalked; peel 3–4 mm. thick, dotted with numerous slightly-depressed oil-glands, yellow when ripe; stipe of fruit rigid, 5 mm. diam. sometimes swelling to 7–8 mm. just below the attachment which is about 6–7 mm. diam.

Bismarck Archipelago. New Ireland: Nukonuko, Namatanai, *Peekel no. 408*. Type in Herb. Bot. Mus. Berlin-Dahlem; fragment of type, Herb. Nat. Arboretum, Washington, sheet no. 46011; serial microtome sections, S. and T., slides 222 B, 1–6 (longitud. sect. ovary), 227 A, 1–17 (cross sect. of same bud), 300 A, 1–2 (pulp vesicles and locule walls), filed in type collection, Nat. Arboretum, Washington. Topotype: Buratamtabai, Namatanai, *G. S. Gee, 5/6/37* (Herb. Nat. Arboretum, sheet no. 46010).

Possible Uses: The fact that *Clymenia* bears a sweet fruit the size of a large lime, and is already cultivated by the Melanesian natives of New Ireland, makes it of unusual interest for trial as a new Citrus fruit tree. It will be very interesting to test *Clymenia* as a root-stock and make hybrids if possible, between it and the five other genera of the True Citrus Fruit Trees (*Citrus, Microcitrus, Fortunella, Eremocitrus* and *Poncirus*) both in the hope of securing new types of edible Citrus fruits and also new root-stocks for experimental tests.

Burkillanthus, a new Genus remotely allied to Pleiospermium

In 1893 a remarkable tree was discovered in the Territory of Malacca, Malay Peninsula; thirty years later it was named *Citrus malaccensis* by Ridley who expressed doubts, however, about its being a species of *Citrus*.

Attention was again called to the anomalous nature of this plant by I. H. Burkill (Gardens' Bull., Straits Settlem. **5**: 218. 1931) but he did not have any additional material, and so was unable to determine its proper taxonomic position.

Through the courtesy of R. E. Holttum, Director of the Botanic Garden of Singapore, I have been able to study the type specimen and the cotype specimen from Malacca, the only collections of this plant made up to now in the Malay Peninsula. A pistil from the type specimen was

restored as nearly as possible to its original condition by a modification of Juel's system, then imbedded, cut into serial microtome sections that were double-stained and mounted permanently. An examination of these serial sections showed clearly that the gynaecium was very different from that of *Citrus* (Plate 3, figures 1, 2).

The fruits of the cotype from Malacca were in such a decayed condition that it was impossible to make out the nature of the tissues found in the locules around the seeds.

Fortunately, at this juncture, Dr. E. D. Merrill called my attention to material of what he considered to be a probable new genus of the *Rutaceae,* that had been collected in northern Sumatra by B. A. Krukoff, and asked me to study it, generously waiving his claim to it. Fruiting specimens of Krukoff's collection, no. 4233 from Asahan, loaned to me by the New York Botanical Garden and by the Arnold Arboretum, showed at once that this Sumatran plant was the same, or very nearly the same, as the one from Malacca Territory, some 400 kilometers to the eastward across the Malacca Strait. This Sumatran material showed well-preserved ripe fruits (Plate 2) that were found to have pulp-vesicles of a new type attached to the locule walls. It was now clearly evident that this plant must be made the type of a new genus.

Burkillanthus,[1] gen. nov.

Pleiospermio remote affinis, sed differt (1) loculis ovarii multiovulatis (22–24), (2) fructu multo majore, mesocarpio eximie sclerotico sub cortice tenui, (3) parietibus dorsalibus loculorum vesiculis pulpiferis magnis, sessilibus, liquido gelatinoso impletis, (4) seminibus numerosis, magnis, glabris.

Arbor ad 14 m. alta; ramis teretibus, spinis rigidis, rectis, singulis, vel binis axillaribus instructis vel inermibus; foliis 1–2–3-foliolatis, acutis, plus minusve acuminatis; nervis primariis numerosis, utrinque 12–18, prominentibus; petiolis longitudine variabilibus, supra anguste alatis vel marginato, basi pulvinatis; floribus magnis (5–6 cm. expansis), in fasciculis paucifloribus axillaribus dispositis, 5-meris; petalis linearispatulatis; staminibus 10; pistillo longo; ovario 5-loculari, ovulis in quoque loculo numerosissimis (22–24), in duobus seriebus dispositis; fructu grandi, ovoideo, cortice glanduloso, mesocarpio eximie sclerotico; loculis 5, pulpa vesiculari seminibus magnis, embryone unico.

[1] I am naming it *Burkillanthus* in honor of I. H. Burkill, former Director of the Singapore Botanical Garden, whose Dictionary of the Economic Products of the Malay Peninsula is an invaluable work of reference filled with the result of painstaking research on the plants of the Malayan region and their products. He has also published valuable notes on this plant.

Twigs terete, glabrous, armed with stout, straight, paired or single axillary spines, or spineless (especially older fruiting twigs); leaves 3- 2- or 1-foliolate; leaflets thin, with numerous (12–18 pairs), strongly marked, subparallel, lateral veins; petioles narrowly winged or sometimes merely margined, with pulvinoid bases, variable in length, articulated with the leaflets; petiolules very short, pulvinoid; inflorescences forming few-flowered clusters in the leaf axils; flowers large, 5-merous, with 10 stamens; pedicels short, about the length of the styles; calyx deeply 5-lobed; petals 5, spathulate; gynophore cylindric, ⅛ as long as the ovary; ovary obclavate, merging abruptly into the much narrower style which is nearly as long as the ovary, with 5 locules, each with 22–24 ovules arranged in 2 rows; fruits large, ovoid, more than twice as long as the longest petioles, with a thin peel dotted with numerous oil-glands covering a thin, hard woody mesocarp; pulp-vesicles numerous, broad-based and sessile (not deeply countersunk) on the dorsal locule wall, cylindrical (or subclavate?), bluntly conical at the apex, hollow (and filled with mucilage?), with rather thick, semitranslucent walls, somewhat roughened on the outside; seeds very numerous, very large, immersed in mucilaginous gum; seeds large with a thin, glabrous slightly wrinkled testa, mono-embryonic.

Burkillanthus is so distinct from any other genus of the Orange subfamily, that it must be considered as representing a rapid evolutionary development of some much simpler ancestral form that probably was somewhat like a 1–3-foliolate species of *Pleiospermium*, such as *P. dubium*. However, *Burkillanthus* has evolved into something very different from any species of *Pleiospermium*. Its large and very hard-shelled fruits resemble in some ways those of the subtribe BALSAMOCITRINAE, but the internal structure of these fruits is strikingly different and precludes close relationship.

There are several other instances of genera in the Orange subfamily that have acquired large, more or less hard-shelled fruits, very different from those of their nearest related genera, for example *Swinglea* of the Philippines, *Merrillia* of the Malay Archipelago and Sumatra. These two genera undoubtedly are not related to each other or to *Burkillanthus*, but seem to represent rapid divergent evolution culminating not in a group of species or genera but, in each case, in a single aberrant monotypic genus.

Robert A. Cockrell (in Papers Mich. Acad. Sci. **20:** 33–36, pl. 9, 1935) finds the wood of *Burkillanthus* as it grows near Asahan, Sumatra, almost exactly like that of *Micromelum pubescens*, but differing decidedly from the wood of all the other genera of the Orange subfamily that

he studied, viz.: *Glycosmis, Clausena, Murraya, Merrillia, Feronia, Aegle, Atalantia* and *Citrus*. He did not, however, have wood of *Pleiospermium* nor of *Swinglea* to compare with that of *Burkillanthus*.

Burkillanthus malaccensis (Ridley) Swingle, comb. nov.

PLATES 2 & 3, FIGURES 1 & 2.

Citrus malaccensis Ridley in Fl. Mal. Penin. **1**: 359. 1922.

A tree up to 14 meters high, some branches with stout, straight, usually paired spines, others spineless, with leaves mostly 1- or 2-foliolate, rarely 3-foliolate, leaflets subcoriaceous but thin, broadly lanceolate or elliptic-lanceolate, acute or more or less acuminate at the tips which are blunt at the very apex; terminal leaflets and 1-foliolate leaves variable in size, often large, 12.5–27 × 4.5–11.5 cm., lateral leaflets much smaller, 6.5–8 × 3–4 cm. with short, pulvinoid petiolules 2–2.5 mm. long; lateral veins (of terminal leaflets) about 12–18 on each side arising at a very wide angle (70°–85°) with the midrib, running subparallel and only slightly curved for ⅔ or ¾ of the distance from the midrib to the margin, then branching dichotomously; base broadly cuneate, articulated with the petiole by means of a pulvinoid petiolule; margin subentire, very slightly coarse-crenate; petioles of the 2- or 3-foliolate leaves 4–5 cm. long, often narrowly winged (3–6 mm. in total width) at apex, narrowing toward the base, often merely margined even at the apex, petioles of 1-foliolate leaves sometimes shorter, 1–3, rarely 4 cm. long, sometimes almost wingless when short; inflorescences forming few- (usually 1–4-)flowered, axillary clusters; flowers large, 5–6 cm. in diam., borne on pedicels 5–7 mm. long; calyx of 5 lanceolate-acuminate, acute sepals with large oil glands, free nearly to the base; petals 5, subspathulate, with oil-glands in the broadened upper part, 20–25 mm. long, 3.5–4.5 mm. wide, tapering into a long slender base 1–1.5 mm. wide; stamens 10, filaments free, long, slender, anthers rather small, oblong; ovary obclavate, 6.5–7 mm. long, 2.5 mm. in diameter at the broadest part (about ⅔ of the distance from the top of the disk to the base of the style, at a point shortly below the tips of the locules) and 1.8–2 mm. in diameter at the base, with 5 locules, each with 22–24 ovules in 2 rows in the upper three-fourths of the locular cavity (Plate 3, figure 2), the entire ovary covered with short sparse pubescence and with a few small oil-glands dotted over the upper half only; style slender, 5.5–6 mm. × 0.5–0.7 mm., with small oil-glands, glabrous, merging abruptly into the tip of the ovary without any definite demarcation, swelling gradually at the tip and surmounted by a depressed globose stigma without oil-glands; disk short, cylindrical, 1.4–1.5 mm. wide, 0.6–0.7 mm. high; fruits large, ovoid, 10–11 × 8–9 cm., outer peel

thin (2–3 mm.), roughened with numerous slightly depressed oil-glands, fitting closely on a woody mesocarp 2–3 mm. thick, very hard in dried fruits, that shows on its outer surface numerous slightly depressed areas 1.5–3 mm. diameter; pulp vesicles 5–12 (or more ?) mm. long and about 1.5–3 mm. wide, sac-like, cylindrical, broad-based and sessile but apparently only very slightly imbedded in the locule wall. These pulp-vesicles are not stalked, near the tip they taper abruptly into a blunt conical apex. They seem to have a semitranslucent, rather thick wall, rough on the outside and are perhaps hollow and full of mucilage. No similar pulp-vesicles are known in any other genus of citrous fruit yet studied. The locules of the ripe fruit are almost filled with large seeds, apparently imbedded in mucilaginous gum, perhaps secreted by the rudimentary pulp-vesicles; the seeds are large, broadly obovate, tapering to an acute point at the base where the seed is attached, 22–27 × 16 × 7–10 mm., mono-embryonic with pale buff (not green) cotyledons, testa thin, papery, irregularly wrinkled when dried.

TYPE: Malay Peninsula, Malacca, Nyalas, *Goodenough no. 1273* (Herb. Bot. Gard. Singapore); Serial microtome sections, S. and T., slides 223 A, 1–10 (cross section of pistil), 244 A, –1, 0, 1–4 (longitud. sect. of pistil), filed in type collection, Herb. Nat. Arboretum, Washington. PARATYPE: Malacca, Bukit Sadanan *Derry no. 1106* (Herb. Bot. Gard. Singapore); Asahan, North Sumatra, *Krukoff no. 4233* (Herb. N. Y. Bot. Gard. and Herb. Arnold Arboretum). Common name: Malay Ghost-lime (*limau hantu*), Sumatran *djeroek oetan.*

POSSIBLE USES: This striking tree is without doubt a member of the subtribe *Citrinae* and very possibly is nearly enough related to *Citrus* to be used as a root-stock for it. *Burkillanthus* has numerous seeds which, because of their large size, should provide the young seedling with abundant nourishment. Very vigorous seedlings should be produced and tested as root-stocks. Now that *Burkillanthus* has been rediscovered in northern Sumatra, it is to be hoped that it can be introduced into culture.

Pleiospermium (Engl.) Swingle, in Jour. Wash. Acad. Sci., **6**: 426. 1916.

Limonia Sect. *Pleiospermium* Engl. Nat. Pflanzenfam. **III. 4**: 189. 1896.

This genus, when I established it in 1916, included *P. alata* (Wight & Arn.) Swingle of India and Ceylon, the type species with 3-foliolate leaves and the polymorphic *P. dubium* (Blume) Swingle of Java with 1- 2- or 3-foliolate leaves with petioles varying decidedly in length, with single or paired spines in the axils of the leaves or spineless.

The three new species here described all have 1-foliolate leaves with more or less broadly winged petioles and in their leaf characters resemble somewhat the 1-foliolate forms of *P. dubium.*

The well developed winged petioles of *Pleiospermium* that are always articulated with the leaf-blade, resemble those of *Burkillanthus* (which has, however, very different flowers and fruits), and are also not unlike those of *Citrus* and *Poncirus*. The pulp-vesicles of *Pleiospermium* are of a primitive type, varying decidedly in form, size and structure in the different species. They show a more or less well-differentiated outer cortical layer surrounding a central portion that seems to disintegrate on maturity much like the cellular contents of the oil-glands found in all the superficial tissues of the *Rutaceae*. None of the species of *Pleiospermium* have broad-based conical pulp-vesicles like *Atalantia* and *Citropsis*, nor slender-stalked juicy pulp-vesicles like *Citrus*.

Nevertheless, these latter genera having more specialized pulp-vesicles may well have developd from remote ancestral Pleiospermium-like forms.

Pleiospermium longisepalum, sp. nov. PLATE 3, FIGURE 5.

Pleiospermio dubio affine, sed differt (1) foliis semper 1-foliolatis, (2) lobis sepalorum gracilibus, longissimis (9–12 mm.), reflexis.

Arbor parva vel arbuscula, ramulis gracilibus (2–3 mm. diam.), junioribus angularibus, inermibus (in ramulis fructiferis); foliis 1-foliolatis, laminis 75–115 × 30–45 mm., ellipticis, integris, apice acuminatis, nervis lateralibus obscuris, utrinque 8–10; petiolis 10–12 mm., anguste alatis (ala ½–⅔ mm. lata); floribus singulis in axillis foliorum, ramulis florentibus apice in inflorescentiam racemosam sine foliis vel cum foliis reductis transientibus; pedicellis 20–25 × 1.5–2 mm., bracteis minutis instructis (pedicellis florum sterilium persistentibus, gracilibus, 15–20 × 0.75–1 mm.); sepalis persistentibus, griseo-viridibus, liguliformibus, 9–12 mm. longis, basi 2 mm. latis, apice 0.5–0.8 mm. latis et obtuse rotundatis vel paulo emarginatis, rectis et valde reflexis sub fructu maturante, intus unum nervum medium exhibentibus, integris; fructibus ovoideis, glabris, griseo-viridibus, 20 × 15 mm., 3-locularibus cum 1–2 ovulis in quoque loculo, vesiculis pulpiferis rudimentariis, corticatis, ellipticis, 4–6 mm. longis, e parietibus dorsalibus loculorum nascentibus, apice obtusis; fructus cortice tenui (1–1.5 mm.), numerosis glandulis oleiferis minutis instructo; seminibus 1–2, circiter 11 × 6 × 4 mm., embryone unico.

BORNEO: Banguey Island, about 11 km. off the extreme northeast point of Borneo and about 50 km. south of Palawan, the westernmost large island of the Philippines, *Castro and Melegrito 1348*. (Type in Herb. Nat. Arboretum, no. 45800; isotype in Herb. Arnold Arboretum; paratype *Castro and Melegrito, 1713,* in Herb. Univ. Calif.)

Dr. E. D. Merrill in a paper "The Flora of Banguey Island" (Phil. Jour. Sci. **29:** 377. 1926) lists it as "*Atalantia* sp.?" but says: "The sepals are linear or strap-shaped, free, persistent, 1 cm. long and about 1.5 mm. wide, in this character differing from both *Citrus* and *Atalantia*." After mentioning that I had found in the fruits pulp-vesicles differing essentially from those of *Citrus*, he says: "Perhaps an undescribed genus is represented here."

Recently in making a close study of *Pleiospermium*, it became evident that this plant was an aberrant species of this genus with 1-foliolate leaves very like *Citrus* and fruits very like those of *P. dubium*, containing similar primitive corticate pulp-vesicles. The extraordinary elongate strap-shaped sepals which become reflexed after anthesis and persist until after the ripe fruits fall off, are a new and very striking character not found on such a grand scale in any other species of the 200 and more belonging to the Orange subfamily. Shorter persistent sepals are found in *P. latialatum*.

Pleiospermium dubium of Java often has unifoliolate leaves on old trees that are much like those of *P. longisepalum*, even to showing frequently a narrow wing on the upper portion of the petiole.

Pleiospermium sumatranum, sp. nov. PLATE 3, FIGURES 3, 4.

Pleiospermio dubio affine, sed differt (1) foliis semper 1-foliolatis, (2) foliolis majoribus, acuminato-caudatis, (3) petiolis distincte alatis, (4) vesiculis pulpiferis minutis (1–2 mm. longis).

Arbor vel arbuscula, ramulis fructiferis inermibus, gracilibus, 1–2 mm. diam.; foliis 1-foliolatis, laminis magnis, 1–7 × 5–6.5 cm., rotundate lanceolatis, acuminato-caudatis, acumine 9–13 mm. longo, deorsum 3–4.5 mm. lato, sursum 1–2 mm. lato, apice abrupte minute emarginato; nervis primariis utrinque 10–12; petiolis 18–20 mm. longis, alatis, apice 3.5–6.5 mm. latis, basi apteris, 4–5 mm. latis; floribus ignotis; calycibus persistentibus, 5-lobis, lobis 2–2.2 mm. longis, 1–2 mm. latis; fructu subgloboso, 18–20 diam., 3-loculari, loculo quoque vesiculis pulpiferis numerosissimis minutis, 1–2 mm. longis et 0.4–0.7 mm. latis, apice rotundatis mucilagine translucente impletis instructo.

SUMATRA: *Korthals no. S 960* (Type in Rijksherbarium, Leiden, sheet no. "908,204– . . . 137"); Sumatra, Paanus, *Korthals no. S 960* (paratype in Rijksherbarium, Leiden, sheet no. "908,204– . . . 132"). Probably a Sumatran specimen labeled "Herb. Korthals?" in Rijksherbarium, Leiden, sheet no. "908,203– . . . 210" is also this species. Known only from this collection.

This species of *Pleiospermium* has the dorsal walls of the three locules of the fruit lined with remarkably small pulp-vesicles which are very numerous, ovoid, bluntly rounded at the tips, 1–2 mm. long, 0.4–0.7 mm. wide, slightly narrowed at the base but not imbedded in the locule wall, cortex very thin, composed of indistinct cells, contents sharply delimited from the cortical layer, decomposing into a spongy (?) mass of oily or mucilaginous matter looking almost exactly like the contents of the oil-glands in the peel of immature fruit (Plate 3, figure 4). Apparently these very small pulp-vesicles secrete a translucent liquid that completely fills the locules of the fruit. In dried herbarium specimens this liquid hardens to a dark reddish brown mass that splinters when struck a sharp blow.

Pleiospermium sumatranum resembles *P. dubium* in having small pulp-vesicles but differs in having only 1-foliolate, larger, more acuminate-caudate leaves that are much like those of *P. longisepalum* and *P. latialatum* and not unlike those of *Citrus* except in being acuminate-caudate.

Pleiospermium latialatum, sp. nov. PLATE 3, FIGURE 6.

Pleiospermio longisepalo affine, sed differt (1) foliis majoribus, acuminato-caudatis, (2) petiolis late alatis, alis cordatis (1.6–2.4 × 1–2 cm.), (3) lobis calycis angustis, triangularibus 4–6 × 2–3 mm., cuneatis, persistentibus, reflexis usque 90° ad pedicellum.

Arbor parva vel arbuscula, ramulis inermibus, ultimis gracilibus (1–2 mm. diam.), primo paulo angulatis, demum teretibus; foliis 1-foliolatis, laminis 9–15 × 3.5–7 cm., glabris, oblongo-ellipticis vel lanceolatis, apice acuminato-caudatis, acumine lineari 4–6 mm. longo, 1.5–2 mm. lato, emarginato, nervis lateralibus utrinque 10–13; petiolis late alatis, cordatis, 1.6–2.4 × 1–2 cm., basi angustatis, pulvinoideis, minute striatis, supra canaliculatis; floribus ignotis; calycis extus puberulentis lobis anguste triangularibus vel apice plus minusve rotundatis, 2–4 mm. longis, 2.5 mm. latis, sub fructu juniore persistentibus reflexis usque 90° ad pedicellum; fructu globoso, 10–14 mm. diam., glabro, cortice viridi, rugoso, glandulis oleiferis crateriformibus numerosis instructo; loculis 3, ad parietes dorsales vesiculis pulpiferis gracillimis 3–4.5 mm. longis acutis indistincte corticatis instructis; seminibus 2 vel 3, magnis, crassis.

Pulp-vesicles slender, conical often ending in a blunt point at the apex 3–4.5 mm. long. The cortical tissue is much thinner than in *P. dubium* and the contents do not break up as completely. The bases of the pulp-vesicles are not so deeply sunken into the dorsal locule walls as in *Atalantia* or *Citropsis*.

BORNEO: Elphinstone Province, Tawao. British North Borneo, *Elmer no. 21542* (Herb. Arnold Arboretum). Known only from the type collection.

This species is clearly related to *P. longisepalum* but differs in so many characters that it appears to be a good species. The leaves look surprisingly like *Citrus,* but the twigs (at least the fruiting ones) are spineless. It is of especial interest as it looks as if it might be a remote ancestor of *Citrus* although its fruits show only rudimentary pulp-vesicles.

This species with *P. longisepalum, P. dubium* and *P. alatum,* constitute a remarkable series: *P. alatum* with always 3-foliolate, *P. dubium* with 1- or 2-foliolate, but occasionally 3-foliolate leaves, *P. longisepalum* with 1-foliolate leaves with narrowly winged petioles, and finally *P. latialatum* with 1-foliolate leaves with broadly winged petioles much like some forms of *Citrus Aurantium.* The pulp-vesicles in this series progress from the short, thickly corticated ones of *P. dubium* to the slender-conical, acute-pointed ones of *P. latialatum.* Much light will doubtless be thrown on the origin and development of pulp-vesicles by a critical study of living material of these and other species of *Pleiospermium.*

EXPLANATION OF PLATES

PLATE 1

Clymenia polyandra (Tanaka) Swingle. Figures 1, 2, 3, type specimen in Herb. Berlin-Dahlem. Figures 4, 5, 6, topotype, Coll. Gee, 5/6/37, preserved in formaldehyde solution.

Figure 1. 1/5 nat. size.
Figure 2. Sections of flower bud. × 5.
Figure 3. Flower buds and pistil. × 1½.
Figure 4. Section of ripe fruit. Nat. size.
Figure 5. Ripe fruit. Nat. size.

PLATE 2

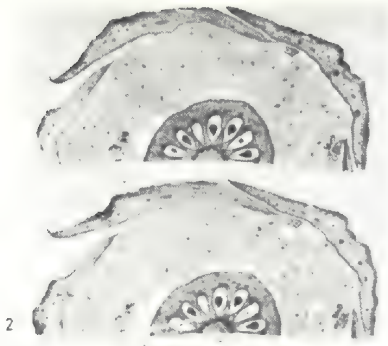
Burkillanthus malaccensis (Ridl.) Swingle. Leafy twig, spines and fruit sections, Coll. Krukoff, Asahan, Sumatra. Nat. size.

PLATE 3

Burkillanthus malaccensis

Figure 1. Type specimen from Malacca Territory. Two axillary flowers. Nat. size.
Figure 2. Nine serial sections of the pistil in Figure 1. × 2.

1



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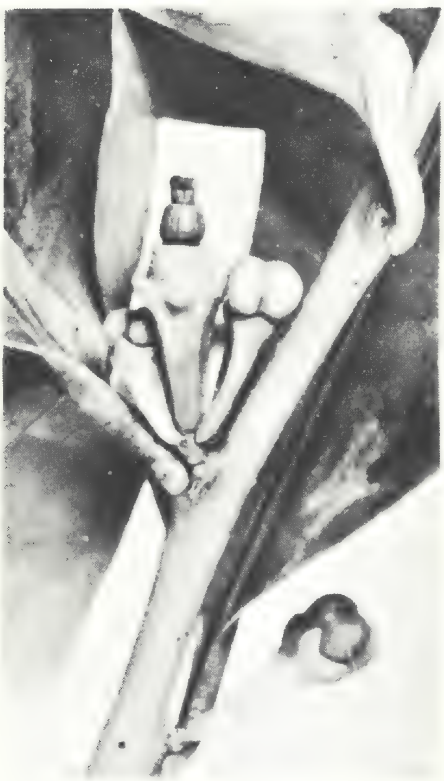

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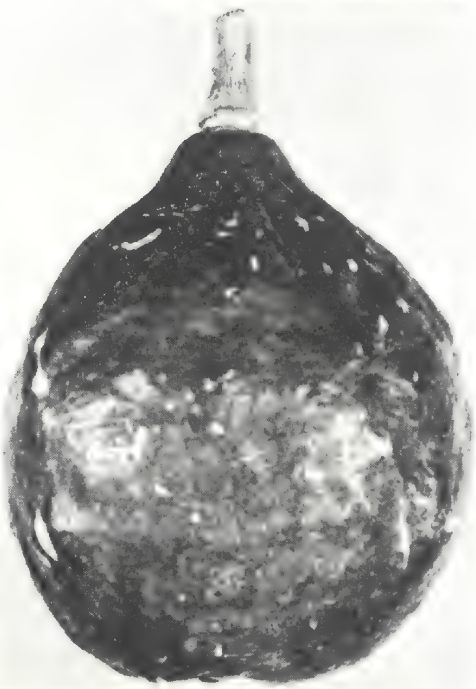

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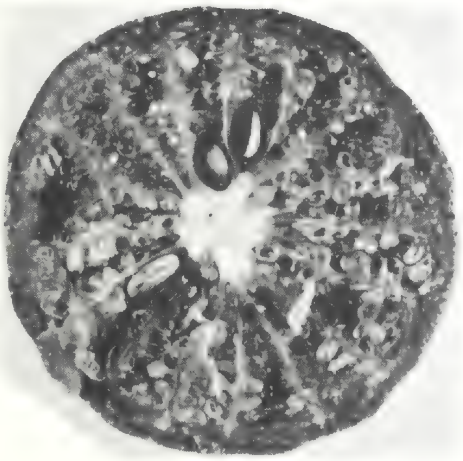


5

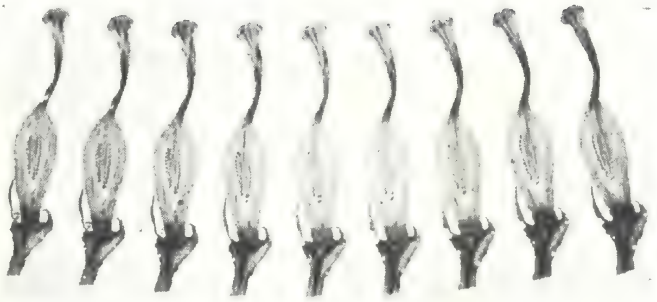
CLYMENIA POLYANDRA (Tanaka) Swingle

FULL-TONE — MERIDEN

BURKILLANTHUS MALACCENSIS (Ridley) Swingle

FULL-TONE — MERIDEN

1



2

4

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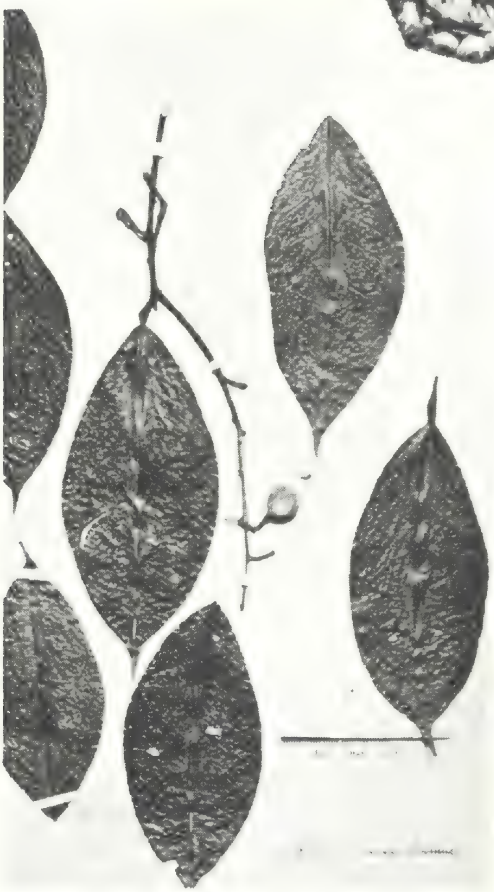

3

6

BURKILLANTHUS MALACCENSIS (Ridley) Swingle, PLEIOSPERMIUM SUMATRANUM Swingle, P. LONGISEPALUM Swingle and P. LATIALATUM Swingle

FULL-TONE — MERIDEN

Pleiospermium sumatranum

Figure 3. Isotype from Sumatra. Fruiting twig. ¼ nat. size.
Figure 4. Type. Cross section of fruit. × 2.

Pleiospermium longisepalum

Figure 5. Type from Banguey Island. Fruiting twig. ¼ nat. size.

Pleiospermium latialatum

Figure 6. Type from North Borneo. Fruiting twig. ¼ nat. size.

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ADDITIONAL NOTES ON HOUTTUYN'S BINOMIALS

E. D. MERRILL

LAST YEAR I published a fairly comprehensive consideration of the numerous new binomials published by Houttuyn and by Christmann and Panzer between the years 1773 and 1788, many of which had been overlooked by all botanists up to 1938.* The following brief notes for the most part include data that were not available at the time the article was published, or in one case, merely calls attention to the fact that I proposed a new binomial that had already been previously published by Thellung.

GRAMINEAE

Chloris capensis (Houtt.) Thellung, Repert. Sp. Nov. **10:** 289. 1912; Merr. Jour. Arnold Arb. **19:** 317. 1938.

This is here mentioned merely to call attention to the fact that in 1912 Thellung made the above transfer, basing *Chloris capensis* Thellung on *Andropogon capense* Houtt. "Plant.-Syst. xii (1785), *t. 93. f. 3,*" thus confusing the Christmann and Panzer "Pflanzensystem" with the original Houttuyn work, Nat. Hist. II. **13:** Aanwyz. Plaat. [2.] *t. 103. f. 3.* 1782, where Houttuyn's binomial first appears. Thellung's binomial is included in the fifth supplement to Index Kewensis but was overlooked by me, my attention having been called to it by Dr. J. Th. Henrard of the Rijks Herbarium, Leiden.

Stipa capillata Linn. Sp. Pl. ed. 2, 116. 1762.

Aristida avenacea Guettard ex Houtt. Nat. Hist. II. **13:** 375. 1782; Panzer, Pflanzensyst. **12:** 512. 1785.
Stipa sp. Merr. Jour. Arnold Arb. **19:** 321. 1938.

Copies of Guettard's two illustrations were sent to Dr. Schischkin, Director of the Principal Botanic Garden, Leningrad, who reports that they were examined by Dr. Rochewitz. The latter concluded that the plant illustrated by Guettard, on which *Aristida avenacea* Guettard, as published by Houttuyn, was based, represents nothing else than *Stipa capillata* Linn. which is still known in Ukrainia as "tirsa." Dr. Rochewitz

*MERRILL, E. D. A critical consideration of Houttuyn's new genera and new species of plants, 1773-1783. Jour. Arnold Arb. **19:** 291-375. 1938.

states that since the drawing was made from plants grown in the relatively humid climate of France, it is but natural that the leaves should be rather broad and the awns straight instead of geniculate. The same phenomenon may be observed in specimens of this species grown in Leningrad. Further allowance must be made for the individual imagination of the artist, who prepared Guettard's plates, whose knowledge of botany was evidently inadequate. This satisfactorily disposes of *Aristida avenacea* Guettard.

Iridaceae

Gladiolus lilaceus Houtt.; Merr. Jour. Arnold Arb. **19:** 326. 1938.

Being unable to place this to my satisfaction an appeal was made to Dr. Compton, who states that Houttuyn's figure and description was shown to several botanists at Kirstenbosch, none of whom were able to identify it with certainty. He further states: "It may be a *Homoglossum* (formerly *Antholyza*) but the fact that the corolla is described as yellow removes it from any species known to us, although of course a colour-variety is not impossible."

Proteaceae

Leucadendron pedunculatum Meisn.; Merr. Jour. Arnold Arb. **19:** 331. 1938, *cum syn.*

Protea linearis Houtt. was placed by me as a synonym of *Leucadendron pedunculatum* Meisn. with the statement that it was suspected, from Houttuyn's excellent figure, that the above species was represented. Dr. R. H. Compton, Director of the National Botanic Gardens at Kirstenbosch, confirms this, stating that Houttuyn's figure represents the male plant of *Leucadendron tortum* R. Br., as interpreted by Phillips & Hutchinson, = *L. pedunculatum* Meisn. N. E. Brown retains *Leucadendron tortum* (Thunb.) R. Br. for an entirely different species, the one described by Robert Brown in 1810 as *Leucadendron fusciflorum* R. Br.

Menispermaceae

In accepting *Tinospora glabra* (Burm. f.) Merr. Jour. Arnold Arb. **19:** 340. 1938 as the oldest valid name for a rather common Javan species, for which Diels accepted the invalid binomial *Tinospora crispa* (Linn.) Diels, Pflanzenr. **46(IV.94):** 142. *f. 49.* 1910, non Miers, I am now able to adjust the synonymy of the much misunderstood *Tinospora crispa* (Linn.) Miers. Dr. D. F. van Slooten courteously supplied me with authentic material of the form Boerlage called *Tinospora Rumphii* Boerl.,

at the same time calling my attention to the obscure publication of the new binomial *Tinospora tuberculata* Beumée. The following supplementary data are supplied:

Tinospora crispa (Linn.) Miers* in Hook. f. & Th. Fl. Ind. **1**: 183. 1855; Diels, Pflanzenr. **46(IV.94)**: 142. 1910, pro parte.

Menispermum crispum Linn. Sp. Pl. ed. 2, 1468. 1763.
Cocculus crispus DC. Syst. **1**: 521. 1818.
Menispermum tuberculatum Lam. Encycl. **4**: 96. 1797.
Menispermum verrucosum Flem. As. Res. **11**: 171. 1807 (Cat. Ind. Med. Pl. 171); Roxb. Fl. Ind. ed. 2, **3**: 808. 1832.
Menispermum rimosum sensu Blanco, Fl. Filip. 810. 1837, non Spreng.
Tinospora Rumphii Boerl. Cat. Hort. Bogor. 116. 1901; Diels, Pflanzenreich **46(IV.94)**: 135. 1910; Merr. Interpret. Rumph. Herb. Amb. 220. 1917, Sp. Blancoanae 145. 1918.
Tinospora Thorelii Gagnep. Bull. Soc. Bot. France **55**: 46. 1908, Lecomte, Fl. Gén. Indo-Chine **1**: 130. 1908.
Tinospora crispa Diels, Pflanzenr. **46(IV.94)**: 142. 1910, pro parte.
Tinospora tuberculata Beumée in Heyne, Nuttige Pl. Nederl. Ind. ed. 2. **1**: 619. 1927.
Funis felleus Rumph. Herb. Amb. **5**: 82. *t. 44. f. 1.* 1747.

This is a case of consistent modern misinterpretations of a Linnaean binomial, for no matter what material Miers may have had before him, *Tinospora crispa* Miers must be interpreted by the Linnaean binomial on which it was based, *Menispermum crispum* Linn. This Linnaean binomial was based wholly on "Funis quadrangularis, *Rumph. amb. 5, p. 83. t. 44. f. 1.*", which, as I noted, this Journal **19**: 341. 1938, involved some confusion, on the part of Linnaeus, between two entirely different plants, *Funis quadrangularis* Rumph., *fig. 2*, and *Funis felleus* Rumph, *fig. 1*, both illustrated on the same plate. The former is *Cissus quadrangularis* Linn., and the latter is the plant with which we are concerned; Linnaeus' reference is to *fig. 1*. There is no possible doubt as to what he actually intended by his *Menispermum crispum*, for he cites the menispermaceous figure, not the vitaceous one. And yet, Diels, in his confused synonymy of *Tinospora crispa* (Linn.) Diels, cites Rumphius' distinctly good illustration of *Funis felleus*, the form with which we are concerned, i.e., the one with broadly ovate, prominently cordate leaves and very verrucose stems, in his synonymy of what is an entirely different species. The latter as illustrated and described by him, *fig. 49, D–O*, is a form with narrower oblong leaves which are only subtruncate or slightly cordate, and smooth stems. This is clearly the one described by Burman f. as

*In many references this binomial is credited to Miers, Ann. Mag. Nat. Hist. II. 7: 38. 1851; it does not there appear.

Menispermum glabrum Burm. f. Fl. Ind. 216. 1768 = *Tinospora glabra* (Burm. f.) Merr. Jour. Arnold Arb. **19**: 340. 1938. Most of the synonyms cited by Diels belong with *Tinospora crispa* (Linn.) Miers, the form described in detail by Diels as *Tinospora Rumphii* Boerl. Beumée, in replacing *Tinospora Rumphii* Diels by the older *Tinospora tuberculata* (Lam.) Beumée, overlooked the fact that *Menispermum tuberculatum* Lam. was essentially only a new name for *Menispermum crispum* Linn., and by citing *Tinosporum crispum* Linn., pro parte, failed to realize that Linnaeus had no actual specimen, and that the sole basis of the Linnaean binomial was the Rumphian illustration. There is no possible "pro parte" unless we wish to interpret Linnaeus' inadvertent confusion of *Funis quadrangularis* Rumph. (*Cissus quadrangularis* Linn.) and *Funis felleus* Rumph. (*Menispermum crispum* Linn.) as noted above. There is no specimen in the Linnaean herbarium, Linnaeus' "Habitat in Bengala" having been taken from Rumphius' statement under *Funis quadrangularis* "Ex Bengala in Bataviam translatus erit hic funis —."; this appertains to *Cissus quadrangularis* Linn., not to *Menispermum crispum* Linn.

Tinospora crispa (Linn.) Miers (not *Tinospora crispa* Diels) is widely distributed in southern Asia and in Malaysia, and is certainly an introduced plant in the Malay Archipelago as it is in the Philippines; Rumphius notes that his *Funis felleus* had been introduced into Amboina in about 1690 but does not indicate its source. It owed its wide distribution to its highly reputed medicinal qualities, the juice being very bitter. It is excellently represented by Merrill, *Species Blancoanae 903*, stems and staminate flowers, March, 1915, and *1003*, leaf specimen from the same plant, October, 1916, this plant being leafless at the time of anthesis. These specimens conform entirely to *Tinospora Rumphii* Boerl., having but three small petals instead of the normal six petals that are found in the other known species of the genus. The fresh branches are much more prominently verrucose than are the dried ones, the Rumphian illustration having been drawn from a fresh specimen.

Dr. Beumée apparently realized the confusion caused by Diels' erroneous treatment of *Tinospora crispa*, and attempted to establish valid names for the two species confused in the latter's consideration, but failed to carry through the interpretation of *Menispermum crispum* Linn. to its logical conclusion. In publishing *Tinospora tuberculata* (Lam.) Beumée, for what proves to be the true *Tinospora crispa* (Linn.) Miers, he also attempted to establish a valid binomial for the other part of what Diels included in *Tinospora crispa* (Linn.) Diels in *Tinospora coriacea* (Blume) Beumée. This falls as a synonym of *Tinospora glabra* (Burm. f.) Merr.:

Tinospora glabra (Burm. f.) Merr. Jour. Arnold Arb. **19**: 340. 1938.

Menispermum glabrum Burm. f. Fl. Ind. 216 (err. typ. 316). 1768.
Cocculus coriaceus Blume, Bijdr. Fl. Nederl. Ind. 25. 1825.
Cocculus bantamensis Blume, op. cit. 26.
Tinospora uliginosa Miers, Ann. Nat. Hist. III. **13**: 321. 1864, *nomen nudum*, Contrib. Bot. **3**: 35. 1871; Hook. f. Fl. Brit. Ind. **1**: 97. 1872; King, Jour. As. Soc. Bengal **58**(*2*): 378. 1889 (Mater. Fl. Malay. Penin. **1**: 22).
Tinospora coriacea Beumée in Heyne, Nuttige Pl. Nederl.-Ind. ed. 2, **1**: 619. 1927.
Tinospora crispa sensu Boerl. Cat. Hort. Bogor. 116. 1901, non Miers.
Tinospora crispa Diels, Pflanzenr. **46(IV.94)**: 142. *incl. f. 49, D–O*. 1910, pro parte, non Miers.

This species differs from true *Tinospora crispa* (Linn.) Miers, not only in the details of its flowers, but also in its narrower, normally oblong, slightly cordate to subtruncate leaves, and its smooth stems. The full extent of its range is uncertain because that given by Diels was due to his inclusion of two very distinct species in his concept of *Tinospora crispa* Diels (non *Menispermum crispum* Linn.). It is common in Java, occurs also in Sumatra, probably in the Malay Peninsula, in spite of the fact that Ridley does not include it, in Borneo, and in the Aru Islands.

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PROPOSED AMENDMENTS TO THE INTERNATIONAL RULES OF BOTANICAL NOMENCLATURE

ALFRED REHDER

THOUGH NO MORE FUNDAMENTAL CHANGES in the Rules of botanical nomenclature should be made, there are a number of minor corrections and adjustments which seem desirable in the articles and the recommendations, particularly in cases where even modern usage varies either for the reason that the rules are not quite clear or that their meaning is frequently misunderstood. Therefore, the following amendments are proposed for consideration at the next International Botanical Congress at Stockholm.

ARTICLE 26

Names of subgenera and sections are *usually*[1] substantives resembling the names of genera. Names of subsections and other lower subdivisions of genera are preferably adjectives in the plural number agreeing in gender with the generic name and written with an initial capital, or their place may be taken by an ordinal number or a letter.

PROPOSED CHANGE

Names of subgenera are *always* and names of sections *usually* substantives resembling the names of genera. Names of subsections and other lower divisions of genera are preferably adjectives in the plural number agreeing in gender with the generic name and written with an initial capital, or their place may be taken by an ordinal number or letter. *The names of all coördinated subdivisions of a genus take the same form, either substantives or adjectives in the plural number.*

DISCUSSION

It is confusing and makes a clear presentation of the subdivisional system of a large genus difficult, to have the names of coördinated subdivisions of different grammatical form, as e.g. *Ribes* sect. *Grossularia* (A. Rich) 1. *Robsonia* (Berl.) and sect. *Ribesia* DC. 1. *Nigra* Engl. (Engler in Nat. Pflanzenfam. III. 2^a: 89, 91. 1890); and Ribes subgen. "*Fasciculatae*" Nakai and subgen. *Berisia* Spach, subgen. *Ribesia* Maxim,

[1]The italicized words indicate changes made in the wording of the articles.

etc. (Nakai, Fl. Sylv. Kor. **15**: 28. 1926). It is against all usage to have names of subgenera in the adjectival form, but the present rules do not prevent this, therefore I propose here to eliminate the word "usually" in reference to subgenera in the first line of article 26. In the names of subsections and lower subdivisions usage varies widely and both forms of names are permitted by the rules, the only restriction should be that one and the same form should be used consistently in each category. The use of nouns for subdivisions, however, may sometimes be carried too far, as by Koehne who has proposed in *Prunus* names in the form of substantives even for series, e.g. *Prunus* subgen. *Cerasus* grex *Typocerasus* sect. *Cremastosepalum* subsect. *Pseudomahaleb* ser. *Cyclaminium* (in Sargent, Pl. Wilson. **1**: 226–227. 1912).

Recommendation XI

(a) To give, where possible, to the principal subdivision of a genus a name which recalls that of the genus with some modification or addition. Thus *Eu* may be placed at the beginning of the generic name when it is of Greek origin, *-astrum, -ella* at the end of the name when Latin, or any other modification consistent with the grammar and usages of the Latin language.

Proposed Change

(a) To give to the subdivision containing the *type species* of a genus preferably the name of the genus modified by the prefix "*Eu*" or to use the generic name without prefix; for other important subdivisions the generic name with the suffix *-ella* or *-astrum* or any other modification may be used.

Examples: Sect. *Eucardamine* Prantl (containing *Cardamine pratensis,* the type species of *Cardamine*); *Sorbus* Sorbus* Pers. (containing *S. aucuparia,* the type species[1] of *Sorbus*); sect. *Cardaminella* Prantl (a second section besides the typical one); sect. *Trifoliastrum* Ser. (not including the type species of the genus, which is *Trifolium pratense,* belonging to sect. *Eutriphyllum* Ser.) — See also Recom. XXXIV.

Discussion

The recommendation, as it stands, does not take cognizance of the fact that the type concept is now one of the fundamental concepts of the Rules

[1]Though in the List of lectotypes of Linnaean genera by A. S. Hitchcock and M. L. Green, *Sorbus domestica* is given as the standard-species, I pointed out in a letter sent January 5, 1937 to the Committee that *S. aucuparia* would be preferable as a lectotype for reasons I stated.

and that it should be made clear that generic names modified by the prefix *Eu* or the generic name without prefix, can only be used for the group containing the type or standard species. Whether the name to which *Eu* is to be prefixed is of Greek origin or not is irrelevant; *Deutzia* with sect. EUDEUTZIA Engl. is certainly not of Greek origin, nor is *Vaccinium* with the subgen. EUVACCINIUM Gray, nor *Rosa* with the subgen. EUROSA Focke.

RECOMMENDATION XI

(d) To avoid in coördinated subdivisions of a genus the use of names in the form of a noun together with those in the form of a plural adjective; the former should be used chiefly for subgenera and sections, the latter for subsections, series and subseries.

PROPOSED CHANGE

(d) To be omitted, since this paragraph has been incorporated in Art. 26.

ARTICLE 48 (3d paragraph)

Where a name and description by one author are published by another author, the word *apud* is used to connect the names of the two authors, except where the name of the second author forms part of the title of a book or periodical, in which case the connecting word *in* is used instead.

Examples: *Teucrium charidemi* Sandwith apud Lacaita (in Cavanillesia).

PROPOSED CHANGE

Where a name with a description or reference to a description by one author is published by another author, the word *in* is used to connect the names of the two authors (or if preferred *apud* may be used in the same sense).

Examples: *Teucrium charidemi* Sandwith in Lacaita (in Cavanillesia, **3:** 38. 1930), the description of a species contributed by Sandwith and published in a paper by Lacaita printed in Cavanillesia; or *Teucrium charidemi* Sandwith in Cavanillesia, **3:** 38 (1930). *Viburnum ternatum* Rehder in Sargent, Trees & Shrubs **2:** 37 (1907).

DISCUSSION

The rule, as it stands, implies that in a full citation "in" is to be used, but in an abbreviated citation it should be changed to "apud," e.g.

Viburnum ternatum Rehder in Sargent, Trees & Shrubs, **2**: 37 (1907), but *V. ternatum* Rehder apud Sargent, because in the latter case the name of the second author does not form part of the title of a book or periodical. Similarly, the connecting preposition in a citation of a reprint would be different from the citation of the original e.g. *Desmodium Handelii* Schindl. in Handel-Mazzetti, Pl. Nov. Sin. Forts. **37**: 1 (1925), but *D. Handelii* Schindl. apud Handel-Mazzetti (in Akad. Anzeig. Wiss. Wien **62**: 234. 1925). Such differences in one and the same citation depending on the more or less complete way of quoting are confusing and it is certainly advisable to use in both cases the usual and simpler preposition "in" instead of the more unusual and cumbersome looking "apud" even though the latter is better classical Latin.

Article 49

When a genus or a group of lower rank is altered in rank but retains its name or epithet, the original author must be cited in parenthesis, followed by the name of the author who effected the alteration. The same holds when a subdivision of a genus, a species, or a group of lower rank, is transferred to another genus or species with or without alteration of rank.

Proposed Change

When a genus or a group of lower rank is altered in rank but retains its name or epithet, the author who first used the name *legitimately* must be cited in parenthesis followed by the name of the author who effected the alteration. The same holds when a subdivision of a genus, a species or a group of lower rank is transferred to another genus or species with or without alteration of rank.

Additional examples: *Syzygium lineatum* (DC.) Merrill & Perry, the transfer being based on the legitimate name *Jambosa lineata* DC., not on the earlier illegitimate *Myrtus lineata* Bl., not Sw. — *Lithocarpus polystachya* (Wall. ex A. DC.) Rehd. or *L. polystachya* (A. DC.) Rehd.

Discussion

The article, as it stands, does not seem to be clear enough to prevent the citation of the author of an epithet in an illegitimate combination. In the first example cited above, *Myrtus lineata* Bl. is certainly the oldest name and Blume is the author of the original epithet, but the name is illegitimate being a later homonym of *M. lineata* Sw. If, however, Blume were cited as the original author in the combination *Syzygium lineatum*

Merr. & Perry (1938), the combination being based on an illegitimate name would be invalidated by the older synonym, *Syzygium longiflorum* Presl (1844); by replacing the parenthetical author "Blume" by the author of a legitimate combination, the new combination has been validated. The author who effects the change is the author of the new combination, even if he does not cite the correct parenthetical author or if he bases his name on an epithet in an illegitimate combination, as long as there is available a legitimate combination with the same epithet and based on the same type. A similar case is *Pseudotsuga taxifolia* (Poir.) Britt.; see under Art. 69. In the second example cited above, either the author of the name *and* the publishing author should be cited or, if an abbreviated citation is used, the publishing author is the one who should be cited according to Art. 48; the citation *Lithocarpus polystachya* (Wall.) Rehd. would be against Art. 48.

New Recommendation XXXI bis

When citing a published name as a synonym, it should be cited as published, without alteration of gender, spelling, designation of categories or of a parenthetical author if given. When citing a nomen nudum, this should be indicated by adding *nom.* or *nom. nud.*

Discussion

One should be able to rely on the correctness of the citation without having to turn to the original to find out the exact form of publication. In a citation of a botanical name, as in any other kind of citation, there should be no alteration, omission or insertion except if indicated in some way. An author has no right to make changes in a name he does not adopt, but cites only as a synonym of the accepted name, e.g. the name *Evonymus alatus β. subtriflora* (Bl.) Franch. & Sav. Enum. Pl. Jap. **2:** 311 (1879), if cited under *Euonymus alata* var. *aptera* Regel[1] as a synonym, should be cited as published, not as *Euonymus alata* var. *subtriflora; Ribes Cynosbati* var. *glabratum* Fernald in Rhodora, **7:** 156 (1905) if considered a synonym, should not be cited as *Ribes Cynosbati glabratum* Fernald, as done by Coville & Britton in N. Am. Flora, **22:** 220 (1906). In a name he adopts an author has to make certain changes to have the name agree with his treatment, but the synonyms should be

[1]Though published by Regel in Mem. Acad. Sci. St. Pétersb. VII. **4**, **4**: 41 (Tent. Fl. Ussur.) (1861) as *Evonymus alatus* Thbg. β. *apterus*, the author who adopts the name has to make it conform to the spelling and the gender used in his treatment of the genus; if it is desirable to give an exact citation of the original publication of the name, it should be cited in synonymy.

cited as published, e.g. *Acer Negundo* var. *interior* (Britt.) Sargent must be changed by the author who adopts this name to *A. Negundo* var. *interius* (Britt.) Sargent, because *Acer* is neuter, but Britton's original binomial if cited as a synonym, should be cited as *A. interior* Britt. If, however, an author should adopt Britton's name as representing a valid species, he should change it to *Acer interius* Britt., and Sargent's combination, if quoted as a synonym, should be cited "*Acer Negundo* var. *interior* Sarg." as published by Sargent.

The original spelling of the adopted name may be given in quotation marks after the citation, e.g. *Acer Negundo* var. *interius* (Britt.) Sargent in Bot. Gaz. **67**: 239 (1919) as "*interior*."

Article 53

When a subdivision of a genus is transferred to another genus (or placed under another generic name for the same genus) *without change of rank,* its subdivisional name must be retained, or (if it has not been retained) must be re-established unless one of the following obstacles exists: (1) that the resulting association of names has been previously published validly for a different subdivision, or (2) that there is available an earlier and validly published subdivisional name of the same rank.

Example: *Saponaria* sect. *Vaccaria* DC., transferred to *Gypsophila,* becomes *Gypsophila* sect. *Vaccaria* (DC.) Godr.

Proposed Change

When a subdivision of a genus is transferred to another genus (or placed under another generic name for the same genus) its subdivisional name must be retained or (if it has not been retained) must be re-established unless one of the following obstacles exists: (1) that the resulting association of names has been previously published validly for a different subdivision or (2) that there is available an earlier and validly published subdivisional name of the *same grammatical form* (either substantive or adjective in the plural number).

Example: *Saponaria* sect. *Vaccaria* Ser. in DC. Prodr. **1**: 365 (1824) transferred to *Gypsophila* becomes *G.* sect. *Vaccaria* (DC.) Godr. in Gren. & Godr. Fl. France, **1**: 227 (1848).

The example given presents a very clear case, since in both combinations the subdivision is designated as "sect.", but there are many cases where there is given no designation of rank at all, or designations other than those recognized in the Rules, as in the following example: *Cerasus* a. *Padus* [Moench] S. F. Gray, Nat. Arr. Brit. Pl. **2**: 589 (1821);

enumerated under *Prunus* as *P.* Rotte *Padi* [Moench] Mertens & Koch, Deutschl. Fl. **3:** 405 (1831), as *P.* sect. *Padi* Koch, Syn. Fl. Germ. **1:** 207 (1837), as *P.* subgen. *Padus* [Moench] Koehne, Dendr. 303 (1893). Other examples of subdivisions without indication of rank are Sorbus L. * *Aria* Persoon, Syn. **2:** 38 (1807); *Yucca* § 1 *Eu-yucca* * *Sarcocarpa* Engelm. in S. Watson, Botany, King Rep. 496 (1871).

Since in many instances the exact rank of the category is not indicated or the established systematic arrangement in the new position of a subdivisional name makes a change of rank necessary, it seems desirable to omit the words "without change of rank" which in this connection can mean only subdivisional rank. It is more important to prevent the coördination of names of a different grammatical form, substantives and adjectives in the plural number (see above under Art. 26).

Article 58

When a tribe becomes a family, when a subgenus or section becomes a genus, when a subdivision of a species becomes a species, or when the reverse of these changes takes place, *and in general when a group changes its rank,* the earliest legitimate name or epithet given to the group in its new rank is valid, unless that name or the resulting association or combination is a later homonym (see Art. 60, 61).

Proposed Change

When a tribe becomes a family, when a subgenus or section becomes a genus, when a subdivision of a species becomes a species, or when the reverse of these changes takes place, the earliest legitimate name or epithet given to the group in its new rank is valid, unless that name or the resulting association or combination is a later homonym (see Art. 60, 61).

Discussion

The phrase "and in general when a group changes its rank" is too sweeping and does not take into account the last sentence in Art. 55 concerning subdivisions of a species: "unless one of the following obstacles exists: . . . (2) that there is an earlier validly published subdivisional epithet available." The fact that reference is made simply to subdivisional epithets and not to "subdivisional epithets of the same rank" shows clearly that nomenclaturally all the subdivisions are considered as of equal rank. The same will apply to subdivisions of a genus, if the proposed change of Art. 53 (see above) is accepted. The change of Art. 53 will bring it into conformity with Art. 55 dealing with sub-

divisions of species, so that in both cases, in regard to the subdivisions of genera and to those of species, the same rule prevails.

Article 69

In cases foreseen in Art. 60–68 the name or epithet to be rejected is replaced by the oldest legitimate name, or (in a combination) by the oldest legitimate epithet which will be, in the new position, in accordance with the Rules. If none exists, a new name or epithet must be chosen. Where a new epithet is required, an author may, if he wishes, adopt an epithet previously given to the group in an illegitimate combination, if there is no obstacle to its employment in the new position or sense.

Proposed Change

In cases foreseen in Art. 60–68 the name or epithet to be rejected is replaced by the oldest legitimate name, or (in a combination) by the oldest legitimate epithet which will be, in the new position, in accordance with the Rules. If none exists, a new name or epithet must be chosen. Where a new epithet is required, an author may, if he wishes, adopt an epithet previously given to the group in an illegitimate combination, if there is no obstacle to its employment in the new position or sense; *the resultant combination is treated as a new name.*

Discussion

It seems desirable to include in the article itself the statement made at the conclusion of the examples. Thus it is made clear that the case is exactly the same as if a new epithet were given. The transferred species or variety is based on the description given under the illegitimate name which is to be cited as a synonym, but its author should not be given as parenthetical author, since the epithet is to be treated as a new one. The objection that the reference to the original description of the group is lost if the author of an illegitimate name is not cited in parenthesis hardly holds, for if a new name is given, the author of the new name only is cited, though he is not the author of the description upon which the name rests. The reference to the original illegitimate name appears only in synonymy. Usually, it will make little difference, if the author of the illegitimate name is cited in parenthesis, but in the case of a second transfer, it becomes important to have it clearly indicated that the epithet is to be considered new; e.g. in the case of *Pseudotsuga taxifolia*. Lambert's name for this species was *Pinus taxifolia* (1803)

which is illegitimate as a later homonym of *P. taxifolia* Salisb. (1796), but in 1804 Poiret transferred the species to *Abies* as *Abies taxifolia*. Since there was at that time no other legitimate name available for this species, he was, according to Art. 69, at liberty to make use of the epithet of the illegitimate binomial of Lambert. If Poiret had not transferred in 1804 the epithet *taxifolia*, the next oldest specific epithet would be *Abies mucronata* Raf. (1832). *Abies taxifolia* is therefore a legitimate name and its epithet the oldest one available for this species. Britton, then, was right in adopting *taxifolia* as the oldest specific epithet, only he erred in basing it on the illegitimate name of Lambert. Britton's name, therefore, stands with the parenthetical author corrected to "(Poir.)," (Cf. Kew Bull. **1938**: 80) and the combination should be cited as *Pseudotsuga taxifolia* (Poir.) Britt., emend. or in a fuller citation the words "Rehder ex Sprague & Green" may be added. (See also Art. 49.)

Article 70

The original spelling of a name or epithet must be retained, except in the case of a typographic error, or of a clearly unintentional orthographic error. When the difference between two generic names lies in the termination, these names must be regarded as distinct, even though differing by one letter only. This does not apply to mere orthographic variants of the same name.

Note 2. The use of a wrong connecting vowel or vowels (or the omission of a connecting vowel in a specific epithet, or in that of a subdivision of a species) is treated as an unintentional orthographic error which may be corrected. (See Rec. XLIV.)

Omission of Note 2 proposed

Discussion

This Note 2 of Article 70 has given rise to a number of changes in generic names and specific epithets or in those of a subdivision of a species which evidently were not intended by this rule. It was certainly not intended by this rule to advocate changes of generic names as *Cercidiphyllum* to *Cercidophyllum*, *Menispermum* to *Menospermum*, *Symphoricarpos* to *Symphorocarpus*, and of adjectival epithets as *atrophoricarpos* to *Symphorocarpus*, and of adjectival epithets as *atrosanguineus* to *atrisanguineus*, *atropurpureus* to *atripurpureus* (e.g., *Evonymus atripurpureus* in Mitt. Deutsch. Dendr. Ges. **39**: 194. 1928) *albo-variegatus* to *albi-variegatus*, *aureo-variegatus* to *aurei-variegatus* (e.g., *Fagus sil-*

vatica m. *aurei-variegata* Aschers. & Graebn. Syn. Mitteleur Fl. **4**: 439. 1911).[1]

The statement that adjectives like atrosanguineus and albovariegatus are against the rules of Latin grammar is not justified, for we find in classical Latin words like albogilvus, albogalerus, primogenitus, sacrosanctus, sacrovir, novocomensis, Laurolavinium.[2]

These compounds have been widely used in botanical Latin for about two hundred years, in names as well as in Latin descriptions; if they should be considered incorrect as epithets in botanical names, all compounds like ovato-lanceolatus, fulvo-tomentosus, stipitato-glandulosus commonly used in descriptions would be formed wrongly and should be changed. These compounds probably have their origin partly in descriptive phrases like "foliis ex albo variegatis" (cf. Weston, Bot. Univ. **1**: 266. 1770).

That Note 2 or Recommendation XLIV does not refer to the cases cited above, may be inferred from the fact that no examples referring to such compounds are given; only compounds are cited like opuntiaeflorus which should be changed to opuntiiflorus.

Anyway, Note 2 does not seem to belong under the Rules, since it speaks of an orthographic error which *may* be corrected, therefore a correction is not obligatory as it should be if it were a rule. The case seems to be taken care of properly by Recommendation XLIV.

Recommendation XLIII

Specific (or other) epithets should be written with a small initial letter except those which are derived from names of persons (substantives or adjectives), or are taken from generic or vernacular names (substantives or adjectives). (See Synopsis of Proposals (1935), p. 55 "Rec. B. XLIII — Proc. 6th Intern. Bot. Congr. **1**: 356.)

Proposed Change

Specific (or other) epithets should be written with a small initial letter except those which are derived from names of persons (substantives or adjectives), or are taken from generic names (*pre-Linnaean and post-Linnaean*), or from vernacular names.

[1] cf. Mitt. Deutsch. Dendr. Ges. **37**: 203-204 (1927) and "Gesammtverzeichnis" **40** (1928) where numerous similar changes have been made and indicated as representing the correct spelling. (See also the writer's note in op. cit. **38**: 333-336.)

[2] In these cases, however, as Dr. A. S. Pease, Professor of Latin, pointed out to the writer citing Kühner-Holzweissig, Ausführl. Gram. Lat. Sprache, 1: 1031, the vowel *o* is not to be considered a connecting vowel, but belongs to the stem of the second declension.

The wording "generic names (substantives or adjectives)" does not seem clear; a generic name must always be a noun, though occasionally in adjectival form, as *Polifolia* of Buxbaum and *Hyssopifolia* of Bauhin. It seems much more important to indicate that the recommendation extends to pre-Linnaean names as well. In the application of this recommendation one has, however, to guard against the mistake sometimes made, to write with a capital letter specific epithets which were elevated to generic later, as is the case with *Sorbus aucuparia* which is often written with a capital letter. Here, however, "aucuparia" was a simple adjective written lower case by Linnaeus who apparently took the name *Sorbus aucuparia* from Bauhin (Pinax, 415. 1623) who cites it as a synonym of *S. sylvestris*. The name was not used as a generic name until 1789 by Medicus (Phil. Bot. **1**: 138).

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JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XX JULY, 1939 NUMBER 3

THE FIRS OF MEXICO AND GUATEMALA

ALFRED REHDER

With a text figure

FOR MORE than a century *Abies religiosa* (H.B.K.) Schlecht. & Cham. was supposed to be the only species of *Abies* growing south of the boundary of the United States, if we except the Rocky Mountain fir, *Abies concolor* (Gord.) Engelm., which was found in 1893 by T. S. Brandegee in northern Lower California. Recently, however, a new species was described from sterile material by Flous and Gaussen, representing the tree of the mountains of Oaxaca; cones of that species were collected last year by Dr. J. H. Faull, who also brought back from his last journey to Guatemala fruiting material of a fir which proves to be a distinct new species.

This material together with the specimens already in the Arnold Arboretum (A.A.) herbarium, the material from the Gray Herbarium (G.H.) and the National Herbarium (U.S.) and a specimen collected by G. U. Skinner from the Kew Herbarium, for the loan of which we are obliged to the curators of these herbaria, has enabled us to give the following account of the firs of Mexico and Guatemala. For assistance in the study of the internal structure of the leaves of the three following species, I am indebted to Dr. J. H. Faull.

Abies religiosa (H.B.K.) Schlechtendal & Chamisso in Linnaea, **5**: 77 (1830). FIG. 1, A-D

Pinus religiosa Humboldt, Bonpland, Kunth, Nov. Gen. Sp. Pl. **2**: 4 (1817).— Parlatore in DC. Prodr. **16**^{2}: 420 (1868).
Pinus hirtella Humboldt, Bonpland, Kunth, l. c. (1817).
Abies hirtella Lindley in Penny Cycl. **1**: 31 (1833).

MEXICO. N u e v o L e o n : Sierra Madre, 140 miles south of

Saltillo, *E. Palmer,* March 1880 (G.H.). Sinaloa: without precise locality, *J. S. Ortega 113* (U.S.). San Luis Potosi: *Virlet,* Aug. 8, 1851 (Herb. Paris, ex Viguié & Gaussen); region of San Luis Potosi, 6000–8000 ft., *Parry & Palmer 847* (ex Hemsley, Biol. Centr.-Am. Bot. **3:** 190. 1882–6). Hidalgo: Sierra de Pachuca, 9200 ft., *C. G. Pringle 13802,* Aug. 28, 1906 (G. H., U.S. with cones, A.A.); Mts. near Pachuca, *J. N. Rose & W. Hough 4454,* June 1, 1899 (U.S., with cone scales). Jalisco: Volcano of Colima, *M. E. Jones 490,* July 13, 1892 (U.S.). Mexico: Temascaltepec, Las Cruces, 3350 m., *G. B. Hinton 3259,* 2–7–1933 (A.A.); Sierra de las Cruces, 9000–11000 ft., *C. G. Pringle 4357,* Oct. 21, 1892 (A.A., U.S.); Mt. Popocatepetl, 8500–11500 ft., *Nelson & Goldman,* Jan. 7, 1894 (U.S. no. 1743094, with cone); *J. N. Rose & R. Hay 6051,* Aug. 7–8, 1901 (U.S.); *J. H. Faull 13270, 13271, 13272,* Dec. 13, 1938 (A.A.); "Ixtacchuatl" [? Ixtahuatlan] 10–12000 ft., *C. A. Purpus 33,* Jan. 1903 (U.S. with ♂ fls.); Acapulco, 7000 ft., *John A. Gamon 14,* March 14, 1921 (U.S.); Amacameca, *Geo. L. Fisher 87,* July 29, 1924 (U.S. with ♂ fls.); El Oro, alt. 2800 m., *Rangel 6628,* Nov. 1910 (U.S.); Ajusco, alt. 8500 ft., *J. H. Faull 13103,* Nov. 23, 1937 (A.A., with cone); Zempoala Nat. Park near Cuernavaca, elev. 8000 ft., *J. H. Faull 13275,* Dec. 1, 1938 (A.A.). Puebla: Manzanilla, vicinity of Puebla, *Bro. Arsène (Bro. Nicolas) 6109,* Nov. 17, 1911 (A.A., U.S.). Vera Cruz: Mt. Orizaba, near Cordoba, 2700 ft., *Henry A. Seaton 233,* Aug. 20, 1891 (G.H., U.S.). Mt. Orizaba, *J. N. Rose & R. Hay 5752,* July 25–26, 1901 (U.S.); Tlacotalpan, *E. W. Nelson 515,* May 21, 1894 (U.S.).[1] Without precise locality: "Mexico," *Dr. J. Gregg 663,* 1848–49 (G.H.).

This species, the type of which was collected by Humboldt and Bonpland between Mazatlan and Chilpancingo, ranges from Nuevo Leon and Sinaloa to Jalisco and western Vera Cruz and occurs in the higher mountains at 2600 to 3350 m. altitude. It is easily distinguished from the two following species by the acute or acutish leaves and the large cone with exserted and reflexed bracts. The two vascular bundles of the leaves are close together while in the two following species they are more widely separated; the hypoderm is continuous or only slightly interrupted below the upper surface, less strongly developed below; there are always two subepidermal resin-canals along the lower surface near the margin of the leaf.

Viguié and Gaussen in their Revision du genre Abies (in Soc. Hist. Nat. Toulouse, **58:** 502–503; Trav. Lab. For. Toulouse, II, art. **1:** 324–325.

[1] The locality given by Nelson is close to the coast and it seems very doubtful if any species of *Abies* would grow there.

1929) cite among the synonyms *Abies glauca* Roezl, *A. glaucescens* Roezl, *A. Lindleyana* Roezl, *A. Tlapalcatuda* Roezl and their subsequent combinations, but all these names are probably referable to *Pseudotsuga taxifolia* (Poir.) Britt., and are enumerated as doubtful synonyms of *Pseudotsuga Flahaultii* Flous (in Bull. Soc. Hist. Nat. Toulous **71**: 92; Trav. Lab. For. Toulouse, Tome II, vol. IV, art. **2**: 60, 1936). Miss Flous' species is apparently only a slight form of the Rocky Mountain Douglas fir, *P. taxifolia* var. *glauca* (Beiss.) Schneid., considered a distinct species by Mayr and by Flous, a subspecies by Schwerin, a forma by Voss and published as a straight trinomial by Sudworth.

Abies Hickeli Flous and Gaussen in Bull. Soc. Hist. Nat. Toulouse, **64**: 24, fig.; in Trav. Lab. For. Toulouse, I, art. **17**: 1, fig. (1932).

FIG. 1, E-I

Arbor: ramuli rubro-brunnei, pulvinis linearibus sulcati, tenuiores, laterales praecipue in sulcis satis hirtelli, robustiores et fructiferi glabrescentes vel glabrae; gemmae ovoideae, obtusae, valde resinosae.

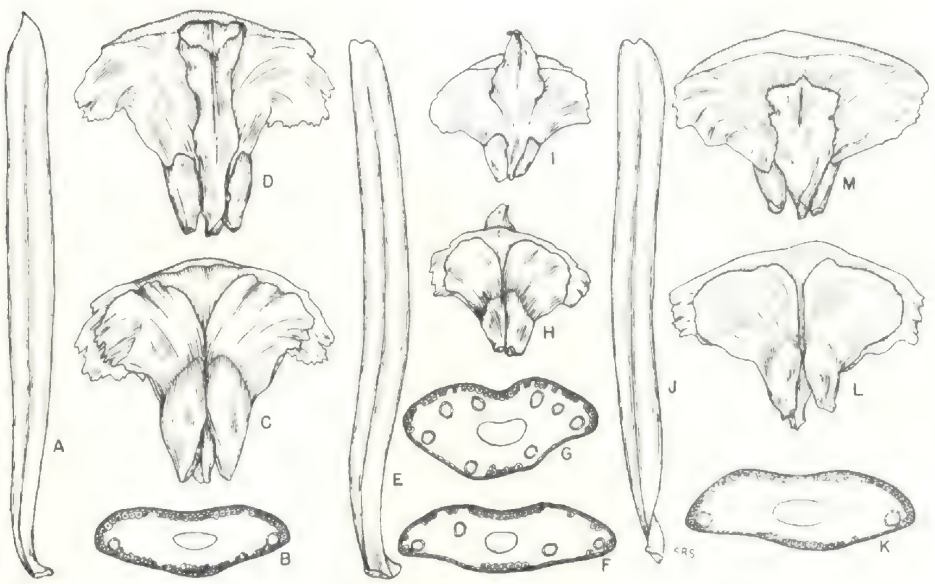

FIGURE 1. ABIES RELIGIOSA (HBK.) Schlecht. & Cham. A. Leaf, × 3.— B. Cross-section of leaf, × 15.— C. Scale with seeds, nat. size.— D. Scale with bract, nat. size. — ABIES HICKELI Flous & Gauss. E. Leaf, × 3.— F. Cross-section of leaf from a sterile branch, × 15.— G. Cross-section of leaf from a fertile branch, × 15.— H. Scale with seeds, nat. size.— I. Scale with bract, nat. size. — ABIES GUATEMALENSIS Rehd. J. Leaf, × 3.— K. Cross-section of leaf × 15.— L. Scale with seeds, nat. size.— M. Scale with bract, nat. size.

Folia subdisticha, sub angulo fere recto patentia, linearia, 1.2–2.6 cm. longa et circiter 1.25 mm. lata, apice obtusa et emarginata, supra pallide viridia, sulcata, subtus cinereo-viridia, costa media leviter elevata, fasciis stomatiferis vix conspicuis e seriebus stomatum 7–8 compositis; canales resiniferi 4–8 (raro 10), 2–4 (raro 5) in folii facie inferiore subepidermales 1–4 (raro 5) in parenchymate partis superioris folii siti; hypoderma bene evolutum sed hic inde interruptum in foliis ramuli fertilis, minus conspicuum in eis ramuli sterilis; fasces fibro-vasculares 2, bene distincti. Strobili subsessiles, maturi oblongo-cylindrici, 6–7 cm. longi et 2.5–3.5 cm. diam., obscure brunnei, apice obtusi; bracteae oblongo-lanceolatae, circ. 2 cm. longae et 6–7 mm. latae, sensim in apicem acuminatum attenuatae, squamam multo superantes, erectae, incurvae et strobilo accumbentes vel leviter patentes, margine inaequaliter inciso-serrulatae; squamae late cuneato-obovatae, 1.4–1.5 cm. altae et 1.8–2 cm. latae, margine extus hirtello-puberulae subito in stipitem circ. 4 mm. longum contractum, alis leviter recurvis et plus minusve auriculatis margine eroso-denticulatis. Semina 6–7 mm. longa, alis subrotundatis squamam fere aequantibus circ. 7 mm. longis et 8–9 mm. latis.

MEXICO. O a x a c a : Alt. 1650 m., *C. Conzatti* in 1900 (type in herb. Bonaparte, Lab. Bot. Lyon, sterile); Cerro de Yalina, alt. 3000 m., *C. Conzatti 951,* June 1899 (G.H.); San Juan del Estado, Distr. da Etla, *C. Conzatti,* Apr. 8, 1938 (sterile); Cerro San Felipe, Distr. dal Centro, alt. 2500–3000 m., *C. Conzatti,* Apr. 8, 1938 (sterile); Ixtepji, Sierra Juarez, Mt. San Felipe, alt. 2500 m., *J. H. Faull 13268, 13269,* Dec. 5, 1938 (with cones); Rancho Tablas, Distr. de Ixtlan, alt. 2500 m., *J. H. Faull 13274,* Dec. 7, 1938 (with cones) (all in herb. A.A.). ? V e r a C r u z : Orizaba, *Botteri 225,* about 1855 (G.H.).

This species was first described in 1932 by Flous and Gaussen, based on a sterile branch collected by C. Conzatti in 1900. As complete material is now available, cones having been collected by Dr. J. H. Faull last year, a full Latin description is given above. The species is readily distinguished from *A. religiosa* by the emarginate leaves with 4–8 resin-canals, the smaller cones with oblong-lanceolate bracts exceeding the scales and directed upward and more or less incurved or sometimes slightly spreading, but never reflexed as in *A. religiosa.* From the following species which also has emarginate leaves, it differs in the smaller cone with exserted bracts and in the leaves with 4–8, rarely 10, resin-canals partly subepidermal and partly situated in the parenchyma near the upper surface of the leaf, and in the less copious hypoderm. The species seems to be restricted to the central mountains of Oaxaca occupying an area situated between that of *A. religiosa* and the following

species. The locality "Orizaba" of Botteri's specimen[1] seems doubtful, for two other collections cited above under *A. religiosa* from the Peak of Orizaba represent the latter species; it is unlikely that both species are growing on the Peak of Orizaba which is well within the range of *A. religiosa,* being in the same latitude as the stations in the District of Mexico and of Pueblo. It is possible that part of the specimens collected by Botteri came from Oaxaca, for Hemsley mentions (Biol. Centr. Am. Bot. **4:** 133) that a small collection of Mexican plants from Professor Sumichrast of Tehuantepec in Oaxaca, was presented in 1877 to Kew by De Candolle, which bears the same numbers for the same species as Botteri's. Tehuantepec is situated about 70 miles southeast of the mountains where *A. Hickeli* is found.

Abies guatemalensis, spec. nov. FIG. 1, J-M

Abies, sp. n. ? Hemsley, Biol. Centr.-Am. Bot. **4:** 89 (1887), nom. nud.

Arbor ad 35 m. alta, trunco 60–90 cm. diam. (ex coll. A. F. Skutch) ramuli fusco-brunnei, pulvinis linearibus sulcati, steriles sat dense, fructiferi sparsius hirtelli; gemmae globoso-ovoideae, valde resinosae. Folia subdistichia, sub angulo fere recto patentia, inaequalia, linearia, 1.5–3 cm. longa et 1.25–2 mm. lata, apice obtusa et emarginata, supra laete viridia, nitidula, sulcata, subtus costa media elevata, marginibus recurvis, fasciis stomatiferis satis conspicuis e seriebus stomatum 8–10 compositis; canales resiniferi 2, subepidermales; hypoderma bene evolutum hic inde interruptum; fasces fibro-vasculares 2, approximati sed distincti. Strobili subsessiles, oblongo-cylindrici, 8.5–11.5 cm. longi et 4.5–5 cm. diam.; bracteae cuneato-obovatae, inclusae et dimidiam squamam aequantes, apice late truncatae et eroso-denticulatae, in medio paullulo vel vix productae; squamae transverse oblongae, circ. 3 cm. latae et 2–2.2 cm. altae, margine extus hirtello-puberuli, alis inaequaliter eroso-denticulatis, basi auriculata et in stipitem 5–6 mm. longum subito contractae; semina cuneato-obovoidea, 8–9 mm. longa, pallide brunnea, alis obovatis 1–1.5 cm. longis et 1.4–1.5 cm. latis.

GUATEMALA. Without special locality, *G. U. Skinner,* about 1850; Mts. above Sija (Totonicapam), *O. F. Cook 33,* May 24, 1906 (U.S., ♂ fls.); Cumbre del Aire, Dept. Totonicapam, alt. 10000 ft., *A. F. Skutch 1279,* Sept. 20, 1934 (sterile); Las Cumbres de Totonicapam, alt. 11000 ft., *J. H. Faull,* Dec. 25, 1936 (sterile); Las Cumbres del Aire, between Quezeltenango and Huehuetenango, alt. 11000 ft., *J. H. Faull,* Dec. 31, 1936 (A.A. with immature cones); Las Cumbres del Aire,

[1]Mateo Botteri collected 1193 numbers in southern Mexico about the year 1855, (see Bonplandia, **5:** 72. 1857).

Huehuetenango, elev. 10000 ft., *J. H. Faull 13104*, Dec. 14, 1937 (type in A.A. with cones).

This species is readily distinguished from *A. religiosa* by the emarginate and pectinately arranged leaves, and from both preceding species by the bracts being only half as long as the scales, truncate at the apex and entirely hidden between the scales. In the pectinately arranged leaves and in their emarginate apex, it agrees with *A. Hickeli*, but differs from it in the broadly obovate bracts truncate at the apex and only about half as long as the scale, and in the leaves having only two resin canals. Both species, *A. Hickeli* and *A. guatemalensis* are easily distinguished, even without cones, from *A. religiosa* by the pectinately spreading emarginate leaves, while in the latter they are on the upper surface of the branch, directed forward and more or less appressed to the branch and always acute or obtusish at the apex, never emarginate.

Abies guatemalensis, which so far is known only from a restricted area near Lake Atitlan in the high mountain range along the western coast of Guatemala, marks the southernmost extension of the range of the whole genus, occurring as it does, between 14° and 15° N. lat., while in Asia and Africa, it does not even reach the Tropic of Cancer. The Guatemalan species seems to have been collected first by George U. Skinner[1] who sent a specimen from Guatemala to J. D. Hooker before 1866, which is cited by Parlatore under *Pinus religiosa* (l. c.).

The references to the occurrence of *Abies religiosa* in Guatemala by later authors are probably all based on this citation. Skinner's specimen in the Kew Herbarium which was kindly sent to me for examination, bears on the sheet besides *A. religiosa* on the original label, also the name *A. hirtella* and annotations by several authors, all doubting the identity of the specimen with *A. religiosa*. A note by J. D. Hooker says "leaves notched at apex" and a similar statement is made in an unsigned note. A note by Wm. R. McNab states that "this differs from *religiosa* in having only a few large hypoderm cells under the epidermis. I believe therefore that *hirtella* is distinct from *religiosa*." There are references by McNab to this specimen in a paper of his in Proc. Roy. Irish Acad. II, **2**: 676 (1877) and in Trans. Scott. Arb. **8**: 97 (1878). There is also a note "not religiosa, Dr. Mayr." These notes may have induced Hemsley to enumerate it as *Abies* sp. n. ? (l. c.). More recently, in 1934, it was again collected by A. F. Skutch, but also without cones. The real nature of the Guatemalan fir was not recognized until Dr. J. H. Faull collected for the Arnold Arboretum in 1936 excellent

[1]For a biographical sketch see Trans. Soc. Bot. Edinb. **9**: 91–99 (1868) and Gard. Chron. **1867**: 180–181.

material with mature cones which enabled us to recognize this fir as a new species.

Abies concolor (Gord.) Engelmann in Trans. St. Louis Acad. Sci. **3**: 600 (Syn. Am. Firs) (1878); repr. p. 8 (1878); in Trelease & Gray, Bot. Works Engelm. 345 (1887).

Abies concolor Lindley & Gordon in Jour. Hort. Soc. Lond. **5**: 210 (1850), nom. nud.

Pinus concolor Engelm. ex Lindley & Gordon, l. c. (1850), pro synon. praeced.

Picea concolor Gordon, Pinet 155 (1858).

Pinus concolor Engelm. herb. ex Parlatore, in DC. Prodr. **16**^{2}: 426 (1868).

Abies grandis var. *concolor* A. Murray in Gard. Chron. n. ser. **3**: 105 (1875).

Mexico. Lower California: San Pedro Martir, *T. S. Brandegee,* May 24, 1893 (A.A.); Vallecitos, Sierra San Pedro Martir, alt. 8060 ft., *I. L. Wiggins & D. Demaree 4979,* Sept. 21, 1930; trees mostly less than 10 ft. tall (G.H.).

This species is widely distributed throughout the Rocky Mountain region from Colorado to Oregon, south to New Mexico and southern California, but in Mexico it has been found only in northern Lower California on the San Pedro Martir Mountain where it was discovered in 1893 by T. S. Brandegee (cf. Zoe, **4**: 210. 1893); the specimens from the San Pedro Martir Mountain differ from typical *A. concolor* in the leaves being more or less curved, thicker, and only 1.5–3 cm. long.

As authors of the name *A. concolor* usually Lindley and Gordon are cited, but they published no description and only cited the unpublished *Pinus concolor* Engelm. as a synonym. The first, though rather brief description is given by Gordon under *Picea concolor;* he only says: "Leaves, long, linear, flat and much resembling those of *Picea grandis* but with both faces of the leaves of the same colour. Cones, cylindrical." Should this not be considered a sufficient description, the parenthetical author would be Parlatore.

Herbarium, Arnold Arboretum,
Harvard University.

PLANTAE KRUKOVIANAE VI[1]

A. C. SMITH

THE PRESENT PAPER is based primarily upon plants collected in Amazonian Brazil by Mr. B. A. Krukoff. The first set of his collections, including the types of new species here described, is deposited in the herbarium of the New York Botanical Garden. The first set of duplicates is deposited at Harvard University (woody plants at the Arnold Arboretum, herbaceous plants at the Gray Herbarium). Other duplicate sets are widely distributed in American and European institutions.

ARACEAE

Philodendron amplectens A. C. Smith, sp. nov.

Planta epiphytica scandens; caudice gracili verruculis minutis asperato, 4–8 mm. crasso, ad nodos radicante, internodiis elongatis 18–22 cm. longis; petiolis supra leviter canaliculatis siccitate striatis, verruculis minutis densissime obtectis, basi vagina decidua circiter 2 cm. longa instructis, 7–11 cm. longis; laminis coriaceis anguste oblongo-deltoideo-sagittatis, 11–15 cm. longis, basi 5.5–7.5 cm. latis, apice breviter acuminatis, lobis posticis oblongis apice rotundatis circiter 4 cm. longis et 2.5 cm. latis sinu lato parabolico sejunctis, nervis lateralibus primariis costalibus quam secundariis atque tertiariis vix crassioribus, basalibus 2 paullo validioribus, nervo collectivo a margine circiter 1 mm. remoto; pedunculo tereti 4–4.5 cm. longo; spatha ovato-oblonga medio leviter constricta, 9.5–10 cm. longa, expansa 4–5.5 cm. lata, convoluta 1.5–2 cm. diametro, apice breviter apiculata; spadice conspicue stipitato (stipite circiter 15 mm. longo et 4 mm. diametro) quam spatha paullo breviore, inflorescentia feminea circiter 2.5 cm. longa, 6–8 mm. crassa, mascula 4–4.5 cm. longa apice obtusa; pistillo subcylindrico circiter 3 mm. longo et 1.5 mm. diametro, 3- vel 4-loculari, multiovulato, stigmate truncato coronato; floribus masculis 3- vel 4-andris, circiter 2 mm. longis.

Type, *Krukoff 7250,* collected Nov. 15, 1934, on margin of Rio Ipixuna between Monte Christo and Santa Victoria, Municipality Humayta,

[1]Previous papers in this series have been published as follows:
I: Bull. Torrey Club **60**: 349–365, 379–396. *pl. 21, 22.* 1933.
II: Bull. Torrey Club **61**: 191–196. 1934.
III: (by H. A. GLEASON): Phytologia **1**: 106–111. 1934.
IV: Phytologia **1**: 113–126. 1935.
V: Brittonia **2**: 145–164. 1936.

basin of Rio Madeira, Amazonas. A species of Engler's Section POLYSPERMIUM, it is related to *P. Jenmanii* Krause and *P. scabrum* Krause, particularly resembling the latter by its scabrid petiole. Than either of these species, however, *P. amplectens* has a much narrower leaf blade and a longer inflorescence stipe. *Philodendron scabrum* has a comparatively short spadix and the pistil is described as several-loculed.

Philodendron solimoesensis A. C. Smith, sp. nov.

Planta epiphytica; petiolis siccitate valde striatis basi teretibus apicem versus supra leviter canaliculatis, circiter 45 cm. longis, inferne 6–7 mm. diametro; laminis coriaceis oblongo-sagittatis, 40–55 cm. longis, basin versus 20–23 cm. latis, lobis posticis triangulari-oblongis sinu profundo acuto distantibus, 19–20 cm. longis, ad 12 cm. latis, apice obtusis, lobo antico oblongo-triangulari apice obtusis, nervis lateralibus primariis utroque circiter 4 a costa patentibus quam secundariis atque tertiariis multo validioribus, basalibus 2 in costulas in sinu longe (3–4 cm.) denudatas conjunctis, nervis secundariis et tertiariis prominulis in nervum collectivum a margine circiter 0.5 mm. remotum conjunctis; pedunculo 5–6 mm. crasso ut videtur brevi; spatha siccitate coriacea apice acuta medio leviter constricta, circiter 20 cm. longa, convoluta 2.5–4 cm. diametro; spadice stipite brevi suffulto, inflorescentia feminea circiter 8 cm. longa et 2–2.5 cm. diametro, mascula circiter 8 cm. longa et 1.5 cm. diametro, apice obtusa; baccis subcylindricis, 7–9 mm. longis, 5–6 mm. diametro, 5-locularibus, stigmatibus subrotundatis coronatis.

Type, *Krukoff 8861,* collected Oct.–Dec., 1936, on terra firma in basin of Creek Belem, Municipality São Paulo de Olivença, basin of Rio Solimoes, Amazonas. A species of Engler's Section POLYSPERMIUM, it is remarkable for the elongate-triangular basal lobes of its sagittate leaves. From *P. maculatum* Krause, a near ally, the new species differs in foliage and also in its substantially larger inflorescence.

Heteropsis linearis A. C. Smith, sp. nov.

Caudex alte scandens; ramulis crassis striatis nigrescentibus 3–5 mm. crassis, teretibus vel apicem versus paullo complanatis, internodiis 2–4 cm. longis; petiolis 1.5–2 mm. crassis striatis supra canaliculatis 3–7 mm. longis; laminis rigide coriaceis linearibus vel angustissime oblongis saepe falcatis, 15–22 cm. longis, 1.8–2 cm. latis, basi attenuatis, apice acutis vel calloso-apiculatis, margine crassis et leviter recurvatis, nervis lateralibus numerosis valde adscendentibus utrinque distincte prominulis prope marginem conjunctis; ramulis floriferis brevibus terminalibus; pedunculo tereti conspicue striato 8–10 mm. longo; spatha non visa; spadice (stipite 6–7 mm. longo suffulto) in siccitate nigrescente oblongo, florifero circiter

35 mm. longo et 7 mm. diametro, apice obtuso; pistillo vertice 3–5 mm. lato, stigmate oblongo instructo.

Type, *Krukoff 8781,* collected Oct.–Dec., 1936, in high forest on terra firma in basin of Creek Belem, Municipality São Paulo de Olivença, basin of Rio Solimoes, Amazonas. It is a very distinct species on the basis of its long and extremely narrow leaves. *Heteropsis rigidifolia* Engl., apparently the closest relative of the new species, has leaves not exceeding 15 cm. in length and not less than 2.5 cm. broad, as well as a shorter spadix.

Heteropsis macrophylla A. C. Smith, sp. nov.

Caudex alte scandens; ramulis crassis 4–8 mm. diametro striatis nigrescentibus teretibus, internodiis 2–4 cm. longis; petiolis 3–4 mm. crassis striatis profunde canaliculatis 9–12 mm. longis; laminis rigide coriaceis anguste oblongis, 18–30 cm. longis, 5–7 cm. latis, supra nitidis, basi obtusis, apice obtusis vel breviter cuspidatis, margine leviter undulatis, nervis lateralibus numerosis rectis adscendentibus utrinque prominulis in nervum collectivum a margine circiter 0.5 mm. remotum conjunctis; ramulis floriferis axillaribus circiter 8 cm. longis; pedunculo crasso tereti striato 12–20 mm. longo; spatha non visa; spadice (stipite brevi suffulto) oblongo, florifero 5–6 cm. longo et medio 1–1.3 cm. diametro, apice obtuso; pistillo vertice 3–5 mm. lato, stigmate punctiformi coronato.

Type, *Krukoff 7151,* collected Nov. 11, 1934, on terra firma on the plateau between Rio Livramento and Rio Ipixuna, Municipality Humayta, basin of Rio Madeira, Amazonas. It is a species characterized by fine coriaceous shining leaves, the largest so far reported for the genus. From *H. Jenmani* Oliv., apparently its closest ally, the new species differs by having its leaves less gradually narrowed at the extremities and lacking an acuminate tip, and by having a very regular collecting nerve extremely close to the leaf margin.

SMILACACEAE

Smilax Krukovii A. C. Smith, sp. nov.

Frutex scandens ubique glaber ut videtur inermis; ramulis teretibus gracilibus; petiolis gracilibus saepe tortuosis 10–17 mm. longis, vetustioribus basi prope ad medium anguste vaginatis, vaginis valde apiculatis; laminis chartaceo-coriaceis opacis supra nitidis lanceolato- vel ovato-oblongis, 10–12 cm. longis, 3.5–5.7 cm. latis, basi cuneato-attenuatis, apice breviter apiculato-acuminatis, margine integris undulatis, 5-nerviis, nervis extimis marginalibus et inconspicuis, nervis alteris supra pro-

minulis subtus prominentibus, venulis reticulatis utrinque prominulis; pedunculis masculis solitariis quam petiolis multo brevioribus, 3–5 mm. longis; receptaculis globosis circiter 4 mm. diametro, bracteolis coriaceis minutis ovatis; pedicellis gracilibus 3–4 mm. longis; floribus ut videtur 18–25 per inflorescentiam, alabastris 3–3.5 mm. longis; perianthii segmentis oblongis apice incurvatis, exterioribus circiter 1.5 mm. latis, interioribus paullo angustioribus; filamentis brevissimis (ad 0.5 mm. longis), antheris oblongis obtusis circiter 2 mm. longis.

Type, *Krukoff 8964,* collected Oct.–Dec., 1936, on shore of creek, basin of Creek Belem, Municipality São Paulo de Olivença, basin of Rio Solimoes, Amazonas. It is a species related to *S. eucalyptifolia* Kunth and its allies, differing from them by its short peduncles, smaller receptacles, and smaller flowers. From *S. gilva* Macbride of adjacent Peru, which it closely resembles in foliage, the new species differs by its globose rather than elongate receptacles, its shorter pedicels, and its somewhat smaller flowers with proportionately shorter filaments.

Smilax graciliflora A. C. Smith, sp. nov.

Frutex scandens ubique glaber; ramulis teretibus parce tuberculatis 2.5–4 mm. crassis, aculeis paucis recurvis 2–5 mm. longis armatis; petiolis 15–40 mm. longis, usque ad ⅓ marginibus inflexis extremitate ut videtur decidue cirrhiferis vaginatis; laminis valde coriaceis opacis anguste ovato-oblongis, 20–27 cm. longis, 6.5–10.5 cm. latis, basi obtuso-attenuatis, apice breviter acuminatis (acumine obtuso 1–1.5 cm. longo), margine integris, 5-nerviis, nervis extimis marginalibus et inconspicuis, nervis alteris supra conspicue impressa subtus prominentibus, venulis reticulatis supra obscuris vel leviter elevatis subtus prominulis; squamis basi ramorum coriaceis ovato-oblongis ad 1 cm. longis; racemis axillaribus ad 13 cm. longis; pedunculis masculis in axillis bractearum oblongarum 6–10 mm. longarum gracilibus 15–30 mm. longis; receptaculis subglobosis 2–3 mm. diametro, bracteolis oblongo-lanceolatis 0.5–1 mm. longis; umbellis masculis 30–60-floris; pedicellis gracilibus 5–8 mm. longis; perianthii segmentis anguste oblongis, exterioribus circiter 5 mm. longis et 1.3–1.5 mm. latis, interioribus paullo minoribus vel similibus; filamentis brevissimis (0.5 mm. longis), antheris oblongis obtusis 2–2.6 mm. longis, dorso squamis minutis argenteis oblongis circiter 0.1 mm. longis copiose lineolatis.

Type, *Krukoff 8806,* collected Oct.–Dec., 1936, in high forest on terra firma, basin of Creek Belem, Municipality São Paulo de Olivença, basin of Rio Solimoes, Amazonas. It is a species characterized by its large coriaceous leaves with the primary nerves impressed above, its slender

peduncles and pedicels, its many-flowered umbels, and its dorsally silver-lineolate anthers. Its relationship is with *S. cinnamomea* Desf. and its allies.

MENISPERMACEAE

Odontocarya tripetala Diels

COLOMBIA. Boyacá: Mt. Chapon Region, *Lawrance 302* (type coll.). BRAZIL. Amazonas: Municipality São Paulo de Olivença, near Palmares, basin of Rio Solimoes, *Krukoff 8182*. BOLIVIA. Beni: Rurrenabaque, *Cardenas 1873*.

The above cited collections indicate the wide distribution which is frequent in Menispermaceae. Dissections of staminate flowers show that the anthers are transversely dehiscent, a character which seems to remove the species from *Odontocarya*. Three petals are also not found elsewhere in the genus. The inflorescence branching suggests *Somphoxylon*, but here also, as in the related *Synandropus*, the anthers are vertically dehiscent. For the time being, Diels' placing of the species is accepted, but future revision of these genera will probably make a separation necessary.

Somphoxylon magnifolium A. C. Smith, sp. nov.

Frutex scandens; ramulis teretibus striatis; petiolis glabris striatis gracilibus (circiter 1.5 mm. crassis) 4–6 cm. longis, basi et apice incrassatis; laminis chartaceis vel papyraceis glabris plus minusve translucidis elliptico-oblongis, 25–28 cm. longis, 11–12 cm. latis, basi rotundatis vel obtuso-rotundatis, apice breviter acuminatis (acumine 7–9 mm. longo apiculato), margine integris, nervis lateralibus 7 vel 8 arcuato-adscendentibus cum costa supra elevatis subtus prominentibus, venulis copiose et arcte reticulatis utrinque prominulis; inflorescentiis masculis perfectis non visis, ramulis minutissime puberulis demum glabris, ramulis primariis gracilibus 7–8 cm. longis, ramulis secundariis 4–8 mm. longis; floribus plerumque solitariis, bracteis ovatis minutis ad 0.5 mm. longis subtentis, breviter pedicellatis vel sessilibus; sepalis 3 exterioribus deltoideis obtusis circiter 0.5 mm. longis et latis, 3 interioribus membranaceis suborbicularibus valde concavis circiter 1 mm. longis et latis; petalis 6 subobovatis vel obcuneatis, circiter 0.8 mm. longis, 0.3–0.5 mm. latis, marginibus inflexis; staminibus 3 circiter 0.6 mm. longis, filamentis connatis, antheris filamenta aequantibus per rimas verticales dehiscentibus.

Type, *Krukoff 7035*, collected Nov. 6, 1934, on terra firma, along Rio Livramento, Municipality Humayta, basin of Rio Madeira, Amazonas. Among the three species recognized to date, *S. magnifolium* most

nearly resembles in leaf shape and venation *S. Klugii* A. C. Smith, a species with much smaller leaves, with more ample inflorescences as evinced by the secondary branches being 2.5–4 cm. long, and with larger flowers. From *S. Wullschlaegelii* Eichl. the new species differs by having its leaves proportionately narrower, its inflorescence apparently more compact, and its flowers conspicuously smaller. The leaf blades of *S. Wullschlaegelii* are 5-nerved from the base, or at least the basal pair of nerves has conspicuous proximal branches; *S. magnifolium* has leaf blades simply 3-nerved from the base.

MONIMIACEAE

Siparuna pachyantha A. C. Smith, sp. nov.

Arbor monoecia ad 20 m. alta, trunco 12–18 cm. diametro; ramulis crassis rugulosis fuscis juventute arcte et densissime lepidoto-tomentellis demum glabris; foliis ramulorum prope apices confertis; petiolis crassis valde canaliculatis 1.5–3.5 cm. longis, ut ramulis novellis tomentellis; laminis chartaceis siccitate fuscis obovato-ellipticis vel elliptico-oblongis, 21–36 cm. longis, 11–15 cm. latis, basi longe attenuatis, apice ut videtur breviter cuspidatis, margine undulatis et leviter revolutis, utrinque praecipue ad nervos stellato-lepidoto-pilosis demum glabrescentibus, pinnatinerviis, costa valida subtus prominente, nervis secundariis utroque 15–17 rectis patulis prope margines conspicue anastomosantibus supra leviter elevatis subtus prominentibus, venulis utrinque prominulis; inflorescentiis axillaribus cymosis plerumque binis 2–6.5 cm. longis, ramulis (cum floribus) densissime stellato-lepidoto-tomentellis; floribus sessilibus vel senectute breviter (ad 2 mm.) pedicellatis, magnitudine valde diversis, obovoideo-globosis, masculis 1.5–3.5 mm. diametro, bracteis 2 vel 3 lineari-oblongis 1–1.5 mm. longis subtentis; receptaculo valde carnoso; tepalis obsoletis; velo leviter conico-elevato, ore minuto; staminibus 2 deltoideis carnosis 0.5–0.8 mm. longis, basi 0.6–0.8 mm. latis, antheris quam filamentis longioribus, per poros ovales contiguos 0.3–0.5 mm. longos dehiscentibus; floribus femineis depresso-globosis quam masculis majoribus ad 4.5 mm. latis; stylis 6–10 ut videtur leviter cohaerentibus non exsertis.

Type, *Krukoff 8674,* collected Oct.–Dec., 1936, in high forest on terra firma in basin of Creek Belem, Municipality São Paulo de Olivença, basin of Rio Solimoes, Amazonas. Another collection from the same region is *Krukoff 8667.* Pistillate flowers are very few and appear to be confined to the lower parts of the inflorescence (or lacking on most inflorescences). In the treatment of Perkins and Gilg in the Pflanzenreich, the new species should be sought near *S. cristata* (P. & E.) A. DC.,

S. lepidantha Perk., and *S. sarmentosa* Perk., but actually it is not very closely related to these, appearing to have no near allies, at least in lowland South America. The thick flowers with only 2 stamens (a constant character in the many flowers examined), the lack of tepals, and the large attenuate-based leaves place the species in an isolated position in the genus.

CELASTRACEAE

Maytenus Krukovii A. C. Smith, sp. nov.

Arbor glabra ad 28 m. alta; ramulis teretibus (vel juventute leviter complanatis) gracilibus mox cinereis; petiolis rugosis anguste alatis vel conspicue canaliculatis 6–9 mm. longis; laminis coriaceis siccitate olivaceis vel fuscis oblongo-ellipticis vel obovato-ellipticis, 9–14 (–18) cm. longis, 3.5–5 (–7) cm. latis, basi attenuatis et in petiolum decurrentibus, apice acuminatis (acumine ad 10 mm. longo ut videtur obtuso), margine leviter revolutis et superne obscure crenato-serratis, costa utrinque prominente, nervis lateralibus utroque 7–9 adscendentibus prope margines anastomosantibus supra immersis et obscuris subtus leviter prominulis, venulis obscuris; inflorescentiis axillaribus glomerulatis 4–5 mm. diametro; floribus sessilibus vel subsessilibus (pedicellis ad 0.5 mm. longis) numerosissimis (50 vel ultra per inflorescentiam), bracteis minutis; calyce cupuliformi, sepalis deltoideis subacutis, 0.8–1 mm. longis, circiter 0.6 mm. latis, apicem versus minute glanduloso-fimbriatis; petalis imbricatis oblongo-deltoideis, 0.8–1.2 mm. longis, circiter 0.8 mm. latis, apice obtusis vel rotundatis; filamentis minutis 0.2 mm. longis apice angustatis; antheris deltoideo-ovoideis, circiter 0.5 mm. longis et latis, basi profunde cordatis, apice minute mucronulatis; disco carnoso circiter 1.2 mm. diametro margine undulato; ovario in disco immerso, stylo crasso circiter 0.4 mm. longo inconspicue lobato; capsula oblongo-obovoidea coriacea, circiter 20 mm. longa et 14 mm. lata, valvis 2, pericarpio 1–1.5 mm. crasso.

Type, *Krukoff 4957,* collected June 21, 1933, on terra firma near mouth of Rio Embira (tributary of Rio Tarauaca), basin of Rio Jurua, Amazonas. Other collections are: between Rio Madeira and Rio Capana, *Krukoff 7310, 7311.* The type is in flower; *7310* is accompanied by a single imperfect fruit; *7311* is sterile. There is little doubt that the specimens are conspecific, although *7311* has slightly larger leaves than the other two.

Maytenus Krukovii closely resembles *M. laurina* Briq. of the Rio Negro in leaf shape and texture, but differs by having its smooth upper leaf surfaces with immersed nerves, while *M. laurina* has the nerves and veinlets sharply impressed above. The inflorescence of *M. laurina,*

although congested, is not strictly glomerulate as that of the new species. *Maytenus Krukovii* also resembles *M. Radlkoferiana* Loes., but differs by having its leaves less conspicuously serrulate and its flowers much more numerous and essentially sessile.

The collector states that this is probably the same species known in Peru as "chuchuhuasca," mentioned by LeCointe.[1] The bark is considered a powerful stimulant and yields an alkaloid similar to cathin, from the leaves of *Catha edulis* Forsk.

Maytenus micrantha A. C. Smith, sp. nov.

Arbor glabra ad 25 m. alta; ramulis patulis subteretibus gracilibus juventute fuscis mox cinereis; petiolis rugosis anguste alatis vel supra complanatis 5–9 mm. longis; laminis coriaceis vel crasse chartaceis siccitate olivaceo-fuscis oblongis vel oblongo-ellipticis, 7–11 cm. longis, 2.3–4.5 cm. latis, basi obtusis et in petiolum decurrentibus, apice ut videtur obtuse acuminatis, margine leviter revolutis et superne obscure crenatis, costa utrinque prominente, nervis lateralibus utroque 10–12 patulis prope margines adscendentibus utrinque manifeste elevatis, venulis utrinque minute prominulis vel obscuris; inflorescentiis axillaribus fasciculatis 3–5 mm. diametro; floribus subsessilibus (pedicellis sub anthesi 0.5–0.7 mm. longis) numerosissimis; bracteis oblongis circiter 0.8 mm. longis, apicem versus fimbriatis; sepalis imbricatis late deltoideis obtusis, circiter 0.6 mm. longis, 0.8–1 mm. latis; petalis imbricatis oblongis obtusis circiter 0.7 mm. longis et latis; filamentis minutis, antheris globoso-deltoideis circiter 0.3 mm. diametro; disco carnoso circiter 0.7 mm. diametro; ovario in disco immerso, stylo crasso circiter 0.3 mm. longo minute lobato.

Type, *Krukoff 6596*, collected Oct. 13, 1934, on terra firma near Livramento, on Rio Livramento, basin of Rio Madeira, Amazonas. It is a species characterized by compact inflorescences and extremely small flowers, closely resembling the preceding (*M. Krukovii*) in inflorescence characters, but differing by its somewhat smaller leaves which are thinner in texture and with spreading lateral nerves obvious on both surfaces. From another allied species which it resembles in leaf shape, *M. ebenifolia* Reiss., the new species differs by having its lateral nerves raised rather than impressed above and by its subsessile smaller flowers.

OCHNACEAE

Krukoviella A. C. Smith, gen. nov.

Flores magni 5-meri. Sepala imbricata, 2 exteriora quam interiora

[1]LeCointe, P. Arvores e plantas uteis, 120. 1934 (Para).

paullo minora. Petala lutea imbricata. Staminodia nulla. Stamina 10 uniseriata ovarium cingentia non secunda; filamentis brevibus ligulatis; antheris erectis, loculis 2 per porum unicum terminalem dehiscentibus. Ovarium fusiforme; placentis 5 fere ad ovarii centrum valde intrusis, hic bifurcatis retroflexis; ovulis numerosissimis in 10 cumulis linearibus arcte imbricatis, uno margine et apice angustissime membranaceo-alatis. Stylus subnullus. Stigmata 5 sessilia minuta linearia radiatim adnata.

Frutex scandens. Folia alternata simplicia; nervis secundariis pinnatis paucis; nervis tertiariis et venulis aequabiliter reticulatis. Stipulae mox caducae, cicatricibus marginibus superioribus ciliatis. Inflorescentiae terminales paniculatae.

The new genus is named in honor of Mr. B. A. Krukoff, in recognition of the value of the thousands of specimens he has collected in Amazonian Brazil in recent years.

Krukoviella is quite unique in the Ochnaceae because of its lack of the subulate style characteristic of the family and its 5 radiating sessile stigmas, which suggest certain genera of Guttiferae. It falls into the Tribe Luxemburgieae, in which, because of the absence of staminodes as well as in inflorescence and foliage characters, it can be related only to *Cespedesia* Goudot and *Godoya* R. & P., being especially close to the latter. In addition to the stigmatic differences, *Krukoviella* differs from *Godoya* as follows: sepals glabrous rather than ciliate at base within; petals bilobed at anthesis rather than entire; stamens in one row rather than two; anthers with a single terminal pore rather than two; placentae parietal rather than axillary. The new plant is said by the collector to be a liana; it has the tertiary nerves hardly distinguishable from the copiously reticulate veinlets and not conspicuously parallel. The species of *Godoya,* on the other hand, are trees; they have the tertiary nerves more or less parallel and usually distinguishable from the veinlets. The stamens of the new genus, in young flowers, are regularly disposed about the ovary, and even at anthesis there is no intimation of zygomorphy as in *Godoya* and its other allies, which have the ovary and stamens divergently secund.

Krukoviella scandens A. C. Smith, sp. nov.

Frutex scandens ubique glaber; ramulis teretibus striatis fusco-cinereis parce lenticellatis; stipulis coriaceis oblongis vel oblongo-obovatis ad 7 mm. longis et 5 mm. latis, apice rotundatis, basi latis, cicatricibus cilia nigra ad 1 mm. longa marginibus superioribus gerentibus; petiolis rugosis supra subplanis 4–7 mm. longis, superne anguste

alatis; laminis coriaceis siccitate supra olivaceis subtus fuscis obovatis, 7–14 cm. longis, 3–6.5 cm. latis, basi acutis vel attenuatis, apice rotundatis et minute mucronulatis vel leviter emarginatis, margine revolutis et crenato-dentatis (dentibus inconspicuis 3–6 per centimetrum), costa utrinque valde prominente, nervis secundariis utroque 14–18 patulis leviter curvatis conspicuis utrinque valde prominulis, nervis tertiariis et venulis copiose reticulatis utrinque prominulis; inflorescentiis sub anthesi ad 18 cm. longis et 10 cm. latis, pedunculo ad 4 cm. longo cum rhachi tereti striato recto, ramulis secundariis alternatis patulis infra nodos saepe complanatis; floribus numerosis, pedicellis gracilibus sub anthesi 6–8 mm. longis superne leviter incrassatis; sepalis coriaceis erectis concavis ovatis vel ovato-oblongis, 2 exterioribus 3–4 mm. longis et circiter 3 mm. latis, 3 interioribus 4–5 mm. longis et 3–4 mm. latis, apice rotundatis, margine integris, basi leviter auriculatis; petalis tenuiter coriaceis obovatis vel obdeltoideis, 10–13 mm. longis, 6–8 mm. latis, juventute integris, sub anthesi apice bilobatis (sinu ad 5 mm. alto, lobis rotundatis), basi ad 1 mm. angustatis, margine apicem versus anguste involutis; filamentis carnosis, 1.5–1.8 mm. longis, basi circiter 0.5 mm. latis, apice leviter incrassatis; antheris mox caducis linearioblongis, 4–5 mm. longis, circiter 1.3 mm. latis, basi truncatis vel leviter auriculatis, apice obtuse cuspidatis, apiculo circiter 0.3 mm. longo, poro minuto; ovario verruculoso leviter 5-sulcato breviter stipitato, sub anthesi 7–9 mm. longo, medio circiter 2 mm. diametro, basi et apice angustato, apice subacuto; stigmatibus albis circiter 0.2 mm. longis.

Type, *Krukoff 8908,* collected Oct.–Dec., 1936, on terra firma in high forest, basin of Creek Belem, Municipality São Paulo de Olivença, Amazonas.

CARYOCARACEAE

Caryocar pallidum A. C. Smith, sp. nov.

Arbor ad 25–35 m. alta ubique glabra; ramulis robustis teretibus fusco-cinereis, cicatricibus stipularum mox delapsarum inconspicuis; petiolis teretibus striatis (2–)5–11 cm. longis; stipellis plerumque 2 conspicuis curvatis 4–9 mm. longis saepe persistentibus; petiolulis supra subplanis subaequalibus gracilibus 4–10 mm. longis; laminis chartaceis vel tenuiter coriaceis siccitate fuscis subaequalibus (terminalibus paullo maximis, lateralibus saepe basi inaequilateralibus) ellipticis, 7–15 cm. longis, 3.5–6.5 cm. latis, basi acutis vel obtusis, apice obtuse cuspidatis (acumine 5–10 mm. longo), margine cartilagineis et conspicue serratis (serraturis 2–3 per centimetrum apice obtusis vel inconspicue apiculatis), costa supra acute elevata subtus prominente, nervis lateralibus

utroque 8–12 adscendentibus prope margines anastomosantibus supra subplanis subtus prominulis, venulis copiose reticulatis supra saepe leviter impressis subtus subplanis; pedunculis crassis 8–10 cm. longis; racemis 15–25-floris, rhachi 3–4 cm. longa copiose lenticellata; pedicellis adscendentibus siccitate valde striatis sub anthesi 15–35 mm. longis, prophyllis nullis; calyce 5–7 mm. longo et summo 9–12 mm. diametro, basi in stipitem crassum 3–5 mm. longum abrupte contracto, lobis 5 deltoideo-ovatis obtusis 4–5 mm. longis et 5–6 mm. latis; petalis et filamentis albis vel flavescentibus; petalis sub anthesi obovato-oblongis, 15–23 mm. longis, 8–13 mm. latis, apice rotundatis et saepe concavis, basi paullo angustatis, margine minutissime serrulatis; staminibus numerosissimis, filamentis filiformibus 2–3 cm. longis, basi in annulum 2–4 mm. longum connatis.

Type, *Krukoff 7011,* collected Nov. 2–19, 1934, on terra firma on the plateau between Rio Livramento and Rio Ipixuna, basin of Rio Madeira, Amazonas. Another collection is: Amazonas: basin of Rio Purus: San Carlos, about 100 miles above Labrea, on terra firma, *Krukoff 5824.* The new species is characterized by its comparatively small white or yellowish flowers, including the filaments, and its glabrous coarsely serrate leaflets with fine reticulate venation. In foliage characters, it closely resembles *C. crenatum* Wittm., from which it differs by the absence of tufted hairs in the axils of secondary nerves, by the absence of pedicellary bractlets, and by its fewer-flowered racemes. *Caryocar dentatum* Gleason, another species with dentate leaflets, has conspicuous pubescence on the petioles, petiolules, lower surfaces of leaflet blades, pedicels, and calyx, and has conspicuously longer filaments. The flower color of neither *C. crenatum* nor *C. dentatum* has been recorded. The Peruvian *C. Tessmannii* Pilger, somewhat similar in general appearance to *C. pallidum,* has scarlet filaments, less distinctly serrate leaflet margins, axillary hair tufts on the lower surfaces of leaflet blades, and no stipels.

Caryocar parviflorum A. C. Smith, sp. nov.

Arbor nobilis ad 45–55 m. alta ubique glabra; ramulis robustis teretibus fuscis saepe lenticellatis, cicatricibus stipularum mox delapsarum inconspicuis; petiolis subteretibus vel apicem versus plus minusve complanatis striatis 2–6 cm. longis; stipellis plerumque 2 involutis curvatis 2–3 mm. longis plerumque persistentibus; petiolulis subaequalibus leviter canaliculatis 3–10 mm. longis; laminis tenuiter coriaceis vel chartaceis siccitate fusco-olivaceis subaequalibus ellipticis vel obovato-ellipticis, 5–9 cm. longis, 2.5–5 cm. latis, basi acutis vel cuneatis (lateralibus paullo

inaequilateralibus), apice obtuse cuspidatis (acumine 2–7 mm. longo saepe calloso-mucronulato), margine cartilagineis subintegris vel undulatis vel remote et inconspicue crenatis, costa supra leviter elevata subtus prominente, nervis lateralibus utroque 8–11 patulis prope margines anastomosantibus utrinque prominulis, venulis copiose reticulatis supra saepe leviter prominulis; pedunculis crassis 5–6 cm. longis; racemis 10–25-floris, rhachi 2–5.5 cm. longa lenticellata; pedicellis siccitate valde striatis sub anthesi 10–20 mm. longis, prophyllis nullis; calyce 4–5 mm. longo et summo 9–11 mm. diametro, basi in stipitem crassum 1–2 mm. longum abrupte contracto, lobis 5 semiorbicularibus circiter 3 mm. longis et 3–5 mm. latis; petalis sub anthesi obovatis, 18–25 mm. longis, 11–13 mm. latis, apice rotundatis, basi angustatis, margine minute erosis; staminibus numerosissimis, filamentis exterioribus coccineis 27–33 mm. longis, basi in annulum brevem connatis, interioribus brevioribus moniliformibus flavescentibus, antheris oblongis ad 0.5 mm. longis; stylis flavescentibus filamentis exterioribus subaequalibus.

Type, *Krukoff 6599,* collected Oct. 13, 1934, on terra firma near Livramento, on Rio Livramento, Municipality Humayta, basin of Rio Madeira, Amazonas. Another collection from the same general region is *Krukoff 6438,* from restinga alta near Tres Casas. A local name is "Piquiarana," which is elsewhere used to designate *C. glabrum* (Aubl.) Pers. Like *C. glabrum,* its closest relative, *C. parviflorum* is a tree of the high forest above flood-level with red or scarlet outer filaments. It may be distinguished from that widespread species primarily by its smaller flowers, of which the outer filaments of fully mature and fallen flowers hardly exceed 3 cm. in length, those of *C. glabrum* usually being about 6 cm. long. The leaflets of the new species appear to be somewhat smaller on the average, more obovate in outline, and more consistently entire than those of *C. glabrum,* and the stipels are more persistent. It is quite likely that future collection of the fruits or nuts will give additional characters to separate the two plants, since in the genus as a whole the fruits provide very reliable characters.

GUTTIFERAE

Vismia cauliflora A. C. Smith, sp. nov.

Frutex vel arbor gracilis ad 8 m. alta; ramulis crassis teretibus juventute dense rufo- vel ferrugineo-tomentosis mox glabrescentibus et cinereis; petiolis crassis (4–6 mm. diametro) 3–15 mm. longis ut ramulis densissime tomentosis; laminis coriaceis anguste obovato-oblongis, 30–45 cm. longis, 8–13 cm. latis, basi anguste rotundatis vel leviter subcordatis,

apice breviter acuminatis (acumine ad 20 mm. longo), margine anguste recurvatis et leviter undulatis, siccitate fusco-olivaceis, supra praeter costam interdum plus minusve tomentellam glabris, subtus nigro-punctatis et dense (costa et nervis densissime) pilis stellatis rufo-ferrugineis tomentellis, costa supra subplana et interdum canaliculata subtus prominentissima, nervis secundariis utroque 18–25 patulis prope margines conspicue anastomosantibus supra impressis et saepe paullo prominulis subtus prominentibus; inflorescentiis e ramulis vel ramis infra folia orientibus glomerulatis, glomerulis conspicuis 1–2 cm. diametro multifloris; floribus sessilibus magnis; calycis laciniis oblongis, 5–6 mm. longis, 1.5–3 mm. latis, apice obtusis, nigro-lineolatis, extra saepe dense rufo-pubescentibus (pilis stellatis 3–5-ramosis patulis 0.4–0.7 mm. diametro), interioribus margine scariosis; petalis lineari-oblongis, 10–12 mm. longis, 1.5–2 mm. latis, nigro-punctatis, apice obtusis, intra dense et pallide villosis; staminodiis oblongis 1.5–1.7 mm. longis obtusis, apicem versus parce villosis; staminum phalangibus ligulatis, 5–6 mm. longis, circiter 0.7 mm. latis, intra parce villosis, filamentis specialibus 10–13 glabris, antheris subglobosis 0.3–0.4 mm. diametro; ovario leviter angulato glabro, stylis carnosis teretibus 7–8 mm. longis, stigmatibus subcapitatis; fructibus (ut videtur immaturis) ovoideis, 6–7 mm. longis, 4–5 mm. latis, stylis coronatis.

Type, *Krukoff 7947,* collected in August, 1936, in an old clearing along road to Aleixo, Municipality Manaos, basin of Rio Negro, Amazonas. Another collection is: Amazonas: Municipality Humayta: basin of Rio Madeira, near Livramento, on terra firma, *Krukoff 6976.* Like other species of the genus, it is known as "Lacre." Although obviously a member of the Section EUVISMIA, *V. cauliflora,* by virtue of the arrangement of its crowded sessile flowers in glomerules on the old branchlets, appears very distinct from any other described species. The extraordinarily large obovate leaves, narrowed toward the base, and the dense ferruginous tomentum of branchlets, principal leaf nerves, etc., also characterize the species.

MYRSINACEAE

Conomorpha madeirensis A. C. Smith, sp. nov.

Arbor ad 6 m. alta; ramulis teretibus fuscis juventute minute ferrugineo-tomentellis mox glabris; petiolis gracilibus rugosis 10–18 mm. longis; laminis chartaceis siccitate fuscis ellipticis, 11–15 cm. longis, 5–8.5 cm. latis, basi acutis et in petiolum decurrentibus, apice obtusis vel rotundatis, margine integris et leviter recurvatis, utrinque (supra inconspicue) punctulis minutissimis pictis, costa supra plana vel leviter elevata

subtus prominente et rugosa, nervis secundariis numerosis parallelis patulis prope margines conspicue anastomosantibus utrinque valde prominulis, venulis reticulatis leviter prominulis; inflorescentiis laxe racemosis 8–13 cm. longis multifloris solitariis, pedunculo brevi et rhachi petiolisque minutissime ferrugineo-tomentellis; pedicellis 0.5–1 mm. longis; sepalis fere ad basim liberis deltoideo-oblongis 1–1.3 mm. longis, parce glanduloso-lineolatis, apice obtusis, margine integris et minute glanduloso-fimbriatis; corolla extra glabra 3–3.5 mm. longa, lobis ad ⅓ connatis oblongis circiter 1.5 mm. latis, apice obtusis, intra minute et dense farinoso-pulverulentibus; staminibus circiter 1 mm. supra basim corollae insertis, filamentis ligulatis 0.3–0.5 mm. longis, antheris deltoideo-oblongis 0.8–1 mm. longis, basi cordatis, apice obtusis; ovario conico sub anthesi circiter 0.6 mm. longo obscure sed dense lepidoto, stylo circiter 1.3 mm. longo truncato.

Type, *Krukoff 7240,* collected Nov. 15, 1934, on margin of Rio Ipixuna between Monte Christo and Santa Victoria, Municipality Humayta, basin of Rio Madeira, Amazonas. It is a species of the alliance of *C. grandiflora* Mez and *C. magnoliifolia* Mez, both of which have coriaceous leaves strongly revolute at margins and conspicuous pedicels. In foliage, the new species more closely resembles *C. obovata* Mez, but that species has much longer pedicels and sessile anthers.

EBENACEAE

Diospyros tenuiflora A. C. Smith, sp. nov.

Frutex ad 5 m. altus; ramulis gracilibus teretibus fuscis juventute copiose puberulis mox glabris; petiolis gracilibus subteretibus 5–10 mm. longis fusco-strigosis; laminis tenuiter coriaceis siccitate olivaceo-fuscis anguste oblongis, 15–24 cm. longis, 4.5–6.5 cm. latis, basi rotundatis vel leviter obtusis, apice longe acuminatis (acumine gracili ad 15 mm. longo obtuso), supra praeter costam strigulosam glabris, subtus ad nervos pallide puberulis, costa supra profunde impressa subtus prominente, nervis secundariis utroque 9–12 prope margines conspicue anastomosantibus utrinque valde elevatis, venulis conspicue et copiose reticulatis utrinque prominulis; inflorescentiis ♂ axillaribus glomerulosis paucifloris; pedicellis ad 2 mm. longis fusco-strigosis; calyce campanulato circiter 5 mm. longo ubique dense et arcte flavido-sericeo (pilis 0.3–0.5 mm. longis), lobis 4 suberectis deltoideo-oblongis, sub anthesi circiter 3 mm. longis et 2 mm. latis, acuminatis; corolla crasse carnosa urceolata 10–12 mm. longa, extra minute et parce flavido-sericea intus glabra, limbo apice constricto, apicem versus circiter 3 mm. diametro, lobis 4

in alabastro imbricatis contortis, circiter 2 mm. latis, apice obtusis; staminibus 10–12 basi corollae affixis, filamentis glabris ad 1.7 mm. longis, antheris oblongis, 1.7–2 mm. longis, dorsaliter flavido-sericeis, basi leviter cordatis, apice acuminatis, per rimas laterales dehiscentibus; ovario minuto dense setoso.

Type, *Krukoff 8431,* collected in Sept.–Oct., 1936, on varzea land near Palmares, Municipality São Paulo de Olivença, basin of Rio Solimoes, Amazonas. In vegetative characters, *D. tenuiflora* most closely resembles *D. Tessmannii* Mildbr., from which it differs by its shorter petioles, its leaf pubescence, its fewer secondary nerves and more obvious veinlets, and its slightly larger flowers, of which the corollas are only sparsely pubescent. The two species appear to form a distinct group in Hiern's Section PARALEA, differing from *D. guianensis* (Aubl.) Gürke in many details of pubescence and leaf texture.

Diospyros bullata A. C. Smith, sp. nov.

Arbor parva vel frutex ad 7 m. altus (interdum scandens); ramulis crassis teretibus juventute densissime brunneo- vel ferrugineo-tomentellis demum glabris; petiolis crassis (ad 5 mm. diametro) rugosis supra complanatis 10–17 mm. longis ut ramulis tomentellis; laminis coriaceis valde bullatis ovato-ellipticis, 15–30 cm. longis, 8–15 cm. latis, basi leviter cordatis vel rotundatis, apice acuminatis (acumine 8–20 mm. longo), margine conspicue revolutis, supra praeter costam et interdum nervos secundarios tomentella glabris, subtus densissime et constanter hispidis (pilis brunneis vel ferrugineis ad 0.6 mm. longis), costa et nervis secundariis utroque 7–10 adscendentibus prope marginem conspicue anastomosantibus supra valde impressis subtus valde prominentibus, venulis reticulatis supra impressis subtus valde elevatis; inflorescentiis ♂ axillaribus cymosis ad 2 cm. longis 8–14-floris, ramulis pedicellis calycibusque densissime ferrugineo-tomentellis (pilis circiter 0.5 mm. longis); bracteis oblongis ad 5 mm. longis acutis intus glabris caducis; pedicellis 3–5 mm. longis; calyce coriaceo sub anthesi circiter 8 mm. longo, lobis ovato-deltoideis subacutis, 5–6 mm. longis, 3–4 mm. latis; corolla carnosa basi extra parce strigosa vel ubique glabra sub anthesi circiter 8 mm. longa profunde 5-lobata, lobis alabastri valde imbricatis sub anthesi rotatis ovato-oblongis obtusis, 5–6 mm. longis, circiter 3 mm. latis, basi subauriculatis; staminibus circiter 50 corollae basi affixis 2–4-seriatis, filamentis subglabris 0.4–0.8 mm. longis, antheris lineari-oblongis 2.2–3.5 mm. longis dorsaliter conspicue setosis (pilis ad 1 mm. longis) apice obtusis; ovario nullo; inflorescentiis ♀ eis supra descriptis plus minusve similibus; calyce ad 12 mm. longo, lobis elongato-

deltoideis, 8–10 mm. longis, 5–7 mm. latis; corolla sub anthesi circiter 12 mm. longa, lobis 8–10 mm. longis, 5–6 mm. latis; staminodiis circiter 18 circiter 2 mm. supra basim corollae affixis linearibus 1.7–3 mm. longis setosis (pilis circiter 2 mm. longis); ovario subgloboso densissime luteo-ferrugineo-setoso (pilis 1.3–1.8 mm. longis), loculis 6, 1-ovulatis, stylis 3 carnosis basi liberis praeter apices strigosis, apice bifidis; calyce sub fructo valde accrescente coriaceo ad 5 cm. diametro intus constanter sericeo, lobis patulis ad 2 cm. longis et 1.5 cm. latis; fructibus subglobosis ad 3 cm. diametro basim versus 5-angulatis, densissime longe setosis vel distaliter glabrescentibus, apice mucronulatis, pericarpio valde coriaceo 1.5–2 mm. crasso extra valde ruguloso.

Type, *Krukoff 8004*, collected in August, 1936, in high forest on terra firma along road to Aleixo, Municipality Manaos, basin of Rio Negro, Amazonas. Other collections from essentially the same locality are *Killip & Smith 30113, Ducke 360, 366.* The flowers are said to be very fragrant, the corollas white without and rosy within. Staminate flowers are described from *Ducke 366,* pistillate from *Ducke 360,* and fruits from the type, which is selected because of abundance of foliage material. On the basis of its 6-celled ovary, *D. bullata* would fall into *Maba* in Hiern's treatment, but recent students have generally preferred to merge this with *Diospyros.* In *Maba,* the new species would be sought in Hiern's Section TRICHANTHERA, in which the size, texture, and venation of the leaves immediately distinguish it. On the basis of corolla shape, stamens, etc., it is best placed in the section ROSPIDIOS of *Diospyros,* where it has no very close allies. In flower size and texture, as well as in foliage, it bears a resemblance to *D. longistyla* A. C. Smith, but the bullate leaves and different pubescence of the new species, as well as the number of locules and styles, differentiate it.

NEW YORK BOTANICAL GARDEN.

PAPUAN GRASSES COLLECTED BY L. J. BRASS. II.*

AGNES CHASE

THE GRASSES HERE DESCRIBED and listed were collected in 1936 in the region of Fly River, British New Guinea. Part I of the Papuan Grasses collected by Mr. Brass, by A. S. Hitchcock, was published in Brittonia **2**: 107–130. 1936. The types of the three species described in the present paper are deposited in the Gray Herbarium, with isotypes in the United States National Herbarium. Only species not previously collected by Mr. Brass in New Guinea are included in the present paper.

Dendrocalamus latifolius Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Südsee 188. 1901.

Arundinaria papuana Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Südsee 186. 1901.

Bambusa papuana K. Schum. & Lauterb. Nachtr. Fl. Deutsch. Südsee 59. 1905.

Dendrocalamus papuanus Pilger, Bot. Jahrb. **52**: 175. 1914. *Arundinaria papuana*, "being the earliest specific name," is transferred to *Dendrocalamus*, but the name has priority of place only, being published on the same date.

Middle Fly River: Lake Daviumbu, *Brass 7908;* rain forest, forming tangled thickets about 3 m. high along edges of sago swamps, on ground rooted over by wild pigs, etc. Western Division: Tarara, Wassi Kussa River, *Brass 8518;* erect clumps 3 m. high, forming thickets in disturbed rain forest; culms glaucous, leaves glaucous beneath, anthers yellow; same locality, *Brass 8660;* forming dense undergrowth 2–4 m. high, erect, in light rain forest fringing streams.

Endemic.

Schizostachyum Brassii A. Camus, Jour. Arnold Arb. **9**: 144. 1928.

Western District: Daru Island, *Brass 6400;* gregarious in thickets, 3–3.5 m. high, along edge of creek fringing rain forest.

This collection has been compared with the type of *S. Brassii*, from Ihu, Vailala River, *Brass 1105*.

Endemic.

*Botanical Results of the Archbold Expeditions.

Schizostachyum sp.

Middle Fly River: Lake Daviumbu, *Brass 7913;* abundant in thickets, 5–6 m. high, marking sites of old native camps on crests of ridges in rain forests; stems glaucous, up to 2.5 cm. in diameter, internodes more than 1 m. long, anthers green.

Eragrostis elongata (Willd.) Jacq. Eclog. Gram. *pl. 3.* 1813.

Poa elongata Willd. Enum. Pl. **1**: 108. 1809.

Western Division: Mabaduan, *Brass 6541;* rare in savanna forests. Middle Fly River: Lake Daviumbu, *Brass 7520, 7853;* gregarious in spreading tufts on patches of hard soil in savannas. Lower Fly River: Gaima, *Brass 8349;* common in open savanna forest.

East Indies to Philippines, New Guinea, and Polynesia.

Eragrostis subaristata Chase, sp. nov.

Perennis; culmi caespitosi, erecti, graciles, 37–65 cm. alti; vaginae subcarinatae; ligula minutissima, ciliolata; laminae complanatae vel involutae, 6–15 cm. longae, 1.5–2.5 mm. latae; panicula purpurea, 7–15 cm. longa, ramis brevibus ascendentibus, inferioribus distantibus circa 3 cm. longis; pedicelli minuti; spiculae aliquam crebrae, 7–9 mm. longae, 2 mm. latae, 6–8-florae; glumae 1.2 et 1.7 mm. longae, acutae, 3-nerviae; lemmata 3–3.5 mm. longa, valde nervata, acuminata vel acuminatissima; palea arcuata, carinis prominentibus.

Perennial, glabrous as a whole; culms caespitose, erect, slender, 37–65 cm. tall; sheaths shorter than the internodes, slightly keeled, usually with a few delicate hairs in the throat; ligule very minute, ciliolate; blades folded or involute, 6–15 cm. long, 1.5–2.5 mm. wide (opened out), often sparsely pilose at base on the upper surface; panicle purplish, 7–15 cm. long, with several rather densely flowered ascending branches, the lower distant, about 3 cm. long, the upper approximate and shorter, the axis and branches rather rigid, angled, a few delicate hairs often borne in the axils, the ultimate branchlets and pedicels scaberulous; spikelets somewhat crowded on minute pedicels, mostly spreading, 7–9 mm. long, 2 mm. wide at maturity, 6–8-flowered, the rachilla strongly zigzag, the joints 1 mm. long or less, readily disarticulating; glumes 1.2 and 1.7 mm. long, acute, 3-nerved; lemmas 3–3.5 mm. long, with strong nerves, the summits spreading, the lower lemmas acuminate, the upper tapering into a slender awn-like tip as much as 1 mm. long; palea bowed out, the keels prominent, short-ciliolate.

Type: *Brass 7879,* collected in September 1936, occasional on wet grass plains, Lake Daviumbu, Middle Fly River. A second collection is *Brass 8348,* common in open savanna forest, Gaima, Lower Fly River.

The strongly pointed lemmas and arching paleas somewhat resemble those of *Eragrostis secundiflora* Presl of North America and *E. harpachnoides* Hack. of Yunnan, China, but are much more subulate than either. In *E. harpachnoides* the spikelets fall entire, the curved pedicels disarticulating.

Lepturus repens (Forst.) R. Br. Prodr. Fl. Nov. Holl. 207. 1810.

Rottboellia repens Forst. f. Prodr. 9. 1786.

Coast between Oriomo and Fly Rivers, *Brass 6411;* sandbinding grass, not common on beach.

Islands, Ceylon to Formosa, Philippines, New Guinea, Polynesia and Hawaiian Islands.

Aristida meraukensis Henrard, Meded. Rijks Herb. Leiden **54**[c] (as 55[c]): 725. 1933.

Western Division: Mabaduan, *Brass 6530, 6576;* common on sandy ridges in savanna forests.

Endemic.

Eleusine indica (L.) Gaertn. Fruct. et Sem. **1**: 8. 1788.

Cynosurus indicus L. Sp. Pl. 72. 1753.

Western Division: Daru Island, *Brass 6302;* common weed in native gardens.

Tropics and warm temperate regions of both hemispheres.

Dactyloctenium aegyptium (L.) Richt. Pl. Eur. **1**: 68. 1890.

Cynosurus aegyptius L. Sp. Pl. 72. 1753.

Western Division: Daru Island, *Brass 6304;* weed in native gardens, not common.

Tropics and warm temperate regions of both hemispheres.

Chloris inflata Link, Enum. Pl. **1**: 105. 1821.

Andropogon barbatum L. Mant. **2**: 302. 1771; not *A. barbatum* L. 1759.
Chloris barbata Swartz, Fl. Ind. Occ. **1**: 200. 1797.
Chloris paraguayensis Steud. Syn. Pl. Glum. **1**: 204. 1854.

Western Division: Daru Island, *Brass 6403;* plentiful on waste ground about the township.

Tropics of both hemispheres.

Oryza minuta Presl, Reliq. Haenk. **1**: 208. 1830.

Oryza manillensis Merr. Philip. Jour. Sci. Bot. **3**: 219. 1908.

Western Division: Mabaduan, *Brass 6547;* scattered in shallow

swamp shaded by swampy rain forest; plants about 1 m. tall; nodes purple, panicle erect.

Tropical Asia, East Indies, Philippines, New Guinea.

The name *Oryza latifolia* Desv. has been misapplied to this species.

Oryza Ridleyi Hook. f. Fl. Brit. Ind. **7**: 93. 1896.

Oryza stenothyrsus K. Schum. in K. Schum. & Lauterb. Nachtr. Fl. Deutsch. Südsee 57. 1905.

Western Division: Tarara, Wassi Kussa River, *Brass 8721;* in small swamp.

Malay Peninsula, Sumatra, Borneo, New Guinea.

Oryza rufipogon Griff. Not. Pl. As. **3**: 5. *pl. 144. f. 2.* 1851.

Middle Fly River: Lake Daviumbu, *Brass 7564;* dominant over large areas of grass-swamp, culms to 3 m. or more long, the leafy summit rising about 1 m. above the surface of the water; awns pink.

India, Ceylon, Borneo, New Guinea.

This form is commonly referred to *Oryza sativa* L. but it appears to be a perennial.

Leersia hexandra Swartz, Prod. Veg. Ind. Occ. 21. 1788.

Homolocenchrus hexandrus Kuntze, Rev. Gen. Pl. **2**: 777. 1891.

Middle Fly River: Lake Daviumbu, *Brass 7601;* margins of swamps and lakes, gregarious in half submerged stands, rising about 1 m. above the surface of the water.

Tropics of both hemispheres.

Leptaspis angustifolia Summerh. & Hubb. Kew Bull. **1927**: 40, 78. 1927.

Western Division: Tarara, Wassi Kussa River, *Brass 8584;* rain forest, in broken shade.

Fiji Islands.

Arundinella nepalensis Trin. Gram. Pan. 62. 1826.

Western Division: Tarara, Wassi Kussa River, *Brass 8664;* savanna forest; rare grass on swampy ground.

China, India to Indo-China; New Guinea.

A slender glabrous form with narrow blades and panicle less densely flowered than usual.

Digitaria quinhonensis A. Camus, Bull. Mus. Hist. Nat. Paris **27**: 456. 1921.

Western Division: Tarara, Wassi Kussa River, *Brass 8695;* common weed in deserted gardens.

Indo-China and New Guinea.

Brachiaria subquadripara (Trin.) Hitchc. Lingnan Sci. Jour. **7**: 214. 1931.

Panicum subquadriparum Trin. Gram. Pan. 145. 1826.

Western Division: Daru Island, *Brass 6301;* common weed in native gardens.

India to Philippines, Australia and Polynesia.

Paspalum scrobiculatum L. Mant. Pl. **1**: 29. 1767.

Paspalum kora Willd. Sp. Pl. **1**: 332. 1797.

Palmer River, 1 mile above junction with Black River, *Brass 6948;* sandbinder on gravel banks.

Tropics of the eastern hemisphere.

Panicum reptans L. Syst. Nat. ed. 10, **2**: 870. 1759.

Panicum prostratum Lam. Tabl. Encycl. **1**: 171. 1791.
Urochloa reptans Stapf in Prain, Fl. Trop. Afr. **9**: 601. 1920.

Western Division: Daru Island, *Brass 6303;* matted on damp soil in native garden clearings.

Tropics of both hemispheres.

Panicum macrocladum Chase, sp. nov.

Perenne; culmi erecti vel ascendentes, 1–1.2 m. alti; vaginae papilloso-hirsutae; ligula hirsuta, 2 mm. longa; laminae planae, elongatae, 4–7 mm. latae, utrinque hirsutae; panicula breviter exserta, 40–48 cm. longa, nutans, ramis elongatis subcapillaribus scabridis; spiculae 3.2–3.5 mm. longae, hiantes, glabrae; gluma prima 2.5–3 mm. longa, acuminata, 5–7-nervia; gluma secunda et lemma sterile subaequalia, subacuminata, 5–7-nervia; fructus 2 mm. longus, 0.9 mm. latus.

Perennial, culms erect or ascending, 1–1.2 meters tall, glabrous; nodes glabrous, often black; foliage olivaceous, the sheaths much shorter than the internodes, papillose-hirsute, the upper sometimes nearly glabrous toward the base; ligule a dense ring of hairs about 2 mm. long; blades flat, 18–30 cm. long, 4–7 mm. (mostly 5 mm.) wide, loosely hirsute on both surfaces or scabrous only toward the attenuate apex, the margins scabrous; panicle short-exserted, 40–48 cm. long, nodding, with numerous subcapillary compound branches as much as 25 cm. long, the slender angled axis and branches scabrous, the branches and branchlets finally spreading, the spikelets mostly aggregate towards the ends of the branchlets, the scabrous pedicels from about as long as the spikelets to twice as long; spikelets 3.2–3.5 mm. long, mostly gaping at the summit, glabrous; first glume from one fourth shorter to nearly as long as the

spikelet, 5–7-nerved, broad, clasping, acuminate; second glume slightly longer than the sterile lemma, both tapering to a relatively blunt but infolded and seemingly sharp tip, 5–7-nerved; fruit 2 mm. long, 0.9 mm. wide, elliptic, smooth and shining.

Type: *Brass 6568,* collected in April 1936, sporadic on damp soil in savanna forest, Mabaduan, Western Division. Other collections are: *Brass 6350,* Daru Island, swampy ground in savanna forest; *Macgregor 18,* "Kuba Kuba," New Guinea.

This species somewhat resembles *Panicum mindanaense* Merr. and *P. caudiglume* Hack., but differs from both in being perennial, taller, and with much longer narrower blades and longer panicles, the first glume not pointed beyond the spikelet as in *P. caudiglume,* and the panicle branches and spikelets much longer than in *P. mindanaense.*

Panicum Braunii Mez, (Bot. Jahrb. **56:** Beibl. **125:** 5. 1921; not *P. Braunii* Steud. 1854), described from Bismarck Archipelago, appears to be this species. The type (*Braun 8*) in the Berlin Herbarium agrees with the Brass collections but not entirely with Mez's description.

? **Panicum papuanum** Mez, Bot. Jahrb. **56:** Beibl. **125:** 6. 1921.

Western Division: Mabaduan, *Brass 6485;* common on old grass-grown garden lands, especially on wet soils.

Endemic.

The type of *Panicum papuanum* has not been examined but *Brass 6485* agrees well with the inadequate description. The type cited is "Insel Waighiou (Lesson)." According to Lasègue (Mus. Bot. Delessert, p. 77. 1845) Lesson visited Waigiou, one of the Papuan islands, in September 1825. This is undoubtedly the island Waig-eoe off the northwest corner of New Guinea.

A Papuan species not represented in the Brass collection is the following:

Panicum cruciabile Chase, nom. nov.

Panicum reticulatum Thwaites in Trimen, Jour. Bot. **23:** 271. 1885; not *P. reticulatum* Torr. 1852, nor Griseb. 1857.

"Hewessee, Pasdun Korle, Aug. 1865 (C.P. [Ceylon Plants] 3890 in Herb. Perad.)."

A specimen of "3890 Thwaites C P" with the name in Thwaites' script is in the U. S. National Herbarium. Hooker (Fl. Brit. Ind. **7:** 48. 1896.) refers *Panicum reticulatum* Thwaites "(non Griseb.)" to *P. caesium* Nees (Hook. Kew Jour. **2:** 97. 1850) and is followed by Trimen (Handb. Fl. Ceylon **5:** 151. 1900), but *P. caesium* Nees in 1850 (based on *Cuming 652* from the Philippines, but scarcely described) is invalidated by *P. caesium* Nees in Hook. & Arn. Bot. Beechey Voy. 235. 1836 (an ally of *Echinochloa crusgalli* [L.] Beauv.)

Merrill (Enum. Philippine Fl. Pl. **1**: 69. 1925) refers *Panicum caesium* Nees 1850 to *Panicum tuberculatum* Presl; but examination of Presl's type, collected by Haenke and said to come from Luzon, shows it to be the same as *Panicum Mertensii* Roth (*P. megiston* Schult.) of the American tropics. Many of Haenke's localities have been found to be erroneous; this collection doubtless came from Central America or Mexico. Alston (Suppl. to Trimen, Handb. Fl. Ceylon 312. 1931) refers *Panicum caesium* Nees 1850, not 1836, to *P. luzonense* Presl. It may be that *Cuming 652* does belong to *P. luzonense*, which has been confused in herbaria with the species described as *P. reticulatum* Thwaites. The latter is a very coarse plant, 1 m. tall or more, with strongly tuberculate-hispid sheaths and panicles 30 to 50 cm. long, the long subsimple branches commonly curving at maturity, the spikelets turgid, 2.5 mm. long, the purple glumes and sterile lemma subacute, reticulate.

The name proposed above refers to the coarse irritating hairs on the sheaths, which readily break off and irritate the skin. The grass is found in Ceylon, Burma, the Philippines, and New Guinea, whence there are two collections: Strickland River, *W. Bauerlen 61* in 1885 (from National Herbarium of Victoria, Melbourne, Australia), and "Ambasi, Papua," *Copeland King 1012*.

Because this has been confused with other species the following specimens of *P. cruciabile* are also cited:

Ceylon: *Thwaites C. P. 3890* (type collection in several herbaria). Burma: *McKerral A18*. Philippines: *Bureau of Science 8122, 23084, 43968; Loher 1716; Merrill 123, 1469, 4229, 6707*.

Panicum viale Chase, sp. nov.

Perenne; culmi erecti vel ascendentes, 0.9–1 m. alti; vaginae tuberculato-hispidae; ligula vix 1 mm. longa; laminae planae, 9–20 cm. longae, 2–4 mm. latae, valde tuberculato-hispidae; paniculae breviter exsertae, 20–32 cm. longae, ramis patentibus usque ad 12 cm. longis, scabridis; spiculae 2 mm. longae, 0.8 mm. latae, apiculatae, glabrae; gluma prima 1 mm. longa, amplectans, abrupte apiculata, 5-nervia; gluma secunda et lemma sterile subaequalia, abrupte subacuminata, 7-nervia; fructus 1.5 mm. longus, 0.8 mm. latus.

Perennial; culms tufted, erect or ascending, 90–100 cm. tall, sparingly branching, tuberculate-hispid; nodes and sheaths tuberculate-hispid like the culms, the sheaths much shorter than the internodes; ligule a ring of stiff hairs scarcely 1 mm. long; blades flat, rather stiff, 9–20 cm. long, 2–4 mm. wide (blades of the basal shoots shorter and narrower), strongly tuberculate-hispid; panicles short-exserted, 20–32 cm. long, with numerous slender spreading compound branches, as much as 12 cm. long, the axis and branches slightly flexuous, but rather stiff, angled, scabrous, spikelet-bearing toward the ends, the pedicels about as long as the spikelets or somewhat longer; spikelets 2 mm. long, 0.8 mm. wide, plump,

abruptly short-pointed, glabrous; first glume half as long as the spikelet, clasping, abruptly pointed, 5-nerved, the nerves obscurely anastomosing; second glume and sterile lemma 7-nerved, acute, but the tips usually inrolled forming sharp points, equal, or the lemma slightly shorter; fruit 1.5 mm. long, 0.8 mm. wide, smooth and shining, at maturity olive-brown, the 5 nerves of the lemma showing as pale stripes.

Type: *Brass 3631,* collected April 11, 1933, fairly common on roadsides, Rona, Laloki River, Central Division. (Previously referred to *Panicum tuberculatum* Presl.)

This species, known only from this collection, resembles *Panicum cruciabile* Chase in its harsh tuberculate pubescence, but is a much more slender plant with much narrower blades, smaller panicles, and smaller spikelets.

Panicum incomtum Trin. Gram. Pan. 200. 1826; Sp. Gram. Ic. **2:** *pl. 232.* 1829.

Panicum sarmentosum of Hook. f. Fl. Brit. Ind. **7:** 54. 1896; not Roxburgh, 1820.

Middle Fly River: Lake Daviumbu, *Brass 7957;* large entangling grass in old village clearing.

India, southern China, and East Indies to the Philippines and New Guinea.

Panicum sarmentosum Roxb., described from Sumatra, has a larger much more open panicle than has *P. incomtum,* the panicle branches not viscid. It is far less common and less widely distributed than *P. incomtum.*

Panicum nodosum Kunth, Rév. Gram. **1:** Suppl. IX. 1830.

Panicum multinode Presl, Reliq. Haenk. **1:** 303. 1830; not *P. multinode* Lam. 1797.
Panicum Arnottianum Nees in Steud. Syn. Pl. Glum. **1:** 59. 1854.
Hemigymnia multinodis Stapf in Prain, Fl. Trop. Afr. **9:** 742. 1920.
Hemigymnia Arnottiana Stapf in Prain, Fl. Trop. Afr. **9:** 742. 1920.
Ottochloa Arnottiana Dandy, Jour. Bot. **69:** 55. 1931.
Ottochloa nodosa Dandy, Jour. Bot. **69:** 55. 1931.

Western Division: Daru Island, *Brass 6260;* abundant, covering the ground under shade of rain forest margins.

India to Indo-China, Sumatra, Java, Borneo, Philippines, and New Guinea.

This specimen agrees with the original description of *P. Arnottianum* Nees, having sparsely pilose blades and simple panicle branches with pubescent spikelets on short branchlets. *Panicum nodosum,* based on

P. multinode Presl, has an open panicle, the glabrous spikelets less clustered. The numerous intermediate specimens and the common geographic distribution of the two forms indicate a variable species. For a further discussion of the application of the accepted binomial see Merrill, Bull. Torr. Bot. Club **60:** 637. 1933.

Panicum marginatum R. Br. Prodr. Fl. Nov. Holl. 190. 1810.

Entolasia marginata (R. Br.) Hughes, Kew Bull. **1923:** 331. 1923.

Western Division: Tarara, Wassi Kussa River, *Brass 8654;* river bank, dry scrub.

Australia.

Cleistochloa subjuncea C. E. Hubb. in Hook. Ic. Pl. **33:** *pl. 3209.* 1933.

Panicum subjunceum Domin, Bibl. Bot. **85:** 314. *f. 70.* 1915; not *P. subjunceum* Ekman, 1911.

Cleistochloa Hubbardiana Henr. Blumea **3:** 161. 1938. Based on *C. subjuncea* C. E. Hubb.

Western Division: Tarara, Wassi Kussa River, *Brass 8735;* on raw clay soils.

Australia.

Hymenachne amplexicaulis (Rudge) Nees, Agrost. Bras. 276. 1829.

Panicum amplexicaule Rudge, Pl. Guian. **1:** 21. *pl. 27.* 1805.

Middle Fly River: Lake Daviumbu, *Brass 7613;* sporadic in stands of *Oryza* and *Leersia* in swamp margins; culms ascending, 1.5 to 2 m. long.

American tropics, India and Ceylon to Indo-China, Formosa, Java, Borneo and New Guinea.

The names *Panicum myuros* Lam. and *Hymenachne myuros* Beauv. have been commonly misapplied to this species.

Isachne globosa (Thunb.) Kuntze, Rev. Gen. Pl. **2:** 778. 1891.

Milium globosum Thunb. Fl. Japon. 49. 1784.

Middle Fly River: Lake Daviumbu, *Brass 7602;* plentiful on shores of lake; culms purple.

China to Philippines and East Indies to New Guinea and Australia.

Echinochloa stagnina (Retz.) Beauv. Agrost. 53, 161, 171. 1812.

Panicum stagninum Retz. Obs. Bot. **5:** 17. 1789.

Fly River: About 30 miles below Everill Junction, *Brass 6585;* forms pure stands along river banks in water more than 6 feet deep.

India and East Indies to Philippines and New Guinea; also tropical Africa.

Pseudoraphis squarrosa (L.) Chase, comb. nov.

Andropogon squarrosus L. f. Suppl. Pl. 433. 1781.
Panicum asperum Koen. Naturforscher **23**: 209. 1788; not *P. asperum* Lam. 1778.
Chamaeraphis aspera Nees in Wall. List no. 8679. 1849. Based on *Panicum asperum* Koen.
Pseudoraphis aspera Pilger, Notizbl. Bot. Gart. Berlin **10**: 210. 1928.

Middle Fly River: Lake Daviumbu, *Brass 7600;* slender floating aquatic, rooting in shallows of swamps, culms often 3 to 4 m. long. Western Division: Penzara, between Morehead and Wassi Kussa Rivers, *Brass 8470;* in shallows of permanent waterhole.

India to Borneo, the Philippines and New Guinea.

Cenchrus Brownii Roem. & Schult. Syst. Veg. **2**: 258. 1817.

Cenchrus inflexus R. Br. Prodr. Fl. Nov. Holl. 195. 1810; not *C. inflexus* Poir. 1804.
Cenchrus viridis Spreng. Syst. Veg. **1**: 301. 1825.

Western Division: Daru Island, *Brass 6395;* plantation weed, not plentiful.

Indo-China and the East Indies to the Philippines, New Guinea and Australia, early introduced in tropical America.

Dimeria falcata Hack. in DC. Monogr. Phan. **6**: 85. 1889.

Middle Fly River: Lake Daviumbu, *Brass 7806;* gregarious on the wetter savannas.

South China, Indo-China and New Guinea.

Saccharum arundinaceum Retz. Obs. Bot. **4**: 14. 1786.

Fly River: About 20 miles below Everill Junction, *Brass 6582;* in pure stands, 3 to 5 m. tall, occupying many miles of the swampy banks of the middle river. [Inflorescence affected by a smut.]

Warm temperate Asia and East Indies to the Philippines and New Guinea.

Ischaemum arundinaceum F. Muell. in Benth. Fl. Austral. **7**: 519. 1878.

Middle Fly River: Lake Daviumbu, *Brass 7900;* dominant, often only grass over large areas of low savanna and wet plain, coarse matted growth 1 to 1.5 m. high. Lower Fly River (east bank): Gaima, *Brass 8259;* common in savanna forests. Western Division: Tarara, Wassi Kussa River, *Brass 8751;* savanna forest, not common.

Australia.

Ischaemum aristatum L. subsp. **barbatum** Hack. in DC. Monogr. Phan. **6**: 204. 1889.

Ischaemum barbatum Retz. Obs. Bot. **6**: 35 [error for 25]. 1791.

Western Division: Daru Island, *Brass 6253;* frequent in tall grass cover of savanna forests.

India, Indo-China, Java and New Guinea.

In this specimen the nodules on the first glume of the perfect spikelets are obsolete or nearly so.

Ischaemum pubescens Merr. Philip. Jour. Sci. Bot. **9**: 264. 1914.

Lower Fly River (east bank): Gaima, *Brass 8260;* occasional in savanna forest grass cover; culms often reclining, to 1.5 m. long.

Philippines.

Sclerandrium truncatiglume (F. Muell.) Stapf & Hubb. in Hook. Ic. Pl. **33**: *pl. 3262*. 1935.

Ischaemum truncatiglumis F. Muell. in Benth. Fl. Austral. **7**: 518. 1878.

Western Division: Tarara, Wassi Kussa River, *Brass 8537, 8665;* savanna forest, occasional on stream banks.

Australia.

Eremochloa bimaculata Hack. in DC. Monogr. Phan. **6**: 265. 1889.

Western Division: Wuroi, Oriomo River, *Brass 5743* (previously referred to *Eremochloa ciliaris* [L.] Merr.); rare on gray-soil savanna ridges, alt. 10–30 m. Tarara, Wassi Kussa River, *Brass 8408;* savanna forests, common.

India.

Rottboellia exaltata L.f. Suppl. 114. 1781.

Manisuris exaltata Kuntze, Rev. Gen. Pl. **2**: 779. 1891.
Stegosia exaltata Nash, N. Amer. Fl. **17**: 84. 1909.

Western Division: Daru Island, *Brass 6296;* plentiful, forming dense brakes on wet garden land behind mangroves; culms erect, to 2 m. tall; hairs on foliage irritating to the skin.

Tropics of both hemispheres.

Thaumastochloa rariflora (F. M. Bailey) C. E. Hubb. in Hook. Ic. Pl. **34**: *pl. 3313*. 1936.

Rottboellia rariflora F. M. Bailey, Dept. Agric. Brisbane Bot. Bull. **8**: 86. 1893.

Western Division: Mabaduan, *Brass 6554;* occasional under the dominant *Themeda triandra* Forsk., in savanna forests. Wuroi, Oriomo River,

alt. 30 m., *Brass 6014;* uncommon, on gray-soil savanna ridge. (Previously referred to *Ophiurus pubescens* [Benth.] Domin.)

Australia.

Thaumastochloa C. E. Hubb., with *Ophiurus pubescens* as type, was published (Hook. Ic. Pl. **34:** *pl. 3313–3314.* 1936) after Part I of The Papuan Grasses appeared. A specimen of *Thaumastochloa pubescens* (Benth.) C. E. Hubb. was later received by the U. S. National Herbarium. The raceme in that is longer, with 4–9 spikelets, the first glumes strongly rugose. This species has not been found in New Guinea. In *T. rariflora* the raceme is reduced to 1 or 2 spikelets, the glumes smooth.

Andropogon sanguineus (Retz.) Merr. Philip. Jour. Sci. Bot. **12:** 101. 1917.

Rottboellia sanguinea Retz. Obs. Bot. **3:** 25 [13]. 1783.

Middle Fly River: Lake Daviumbu, *Brass 7933;* occasional on sour savanna slopes.

Southern China and India and Indian Archipelago to Indo-China, Philippines and New Guinea.

Andropogon annulatus Forsk. var. **monostachys** F. Muell.; Benth. Fl. Austral. **7:** 531. 1878.

Western Division: Daru Island, *Brass 6404;* growing about the wharf, apparently of recent introduction. Central Division: Port Moresby, 200 m. alt., *Brass 8787;* common on roadsides.

Australia.

Vetiveria filipes (Benth.) C. E. Hubb. Kew Bull. **1934:** 444. 1934.

Chrysopogon elongatus (R. Br.) Benth. var. *filipes* Benth. Fl. Austral. **7:** 539. 1878.

Western Division: Penzara, between Morehead and Wassi Kussa River, *Brass 8460;* savanna-forests, on alluvial flats of creek. Tarara, Wassi Kussa River, *Brass 8579;* covering small tidal flats behind mangrove fringe.

Australia.

Rhaphis aciculata (Retz.) Desv. Opusc. 69. 1831.

Andropogon aciculatus Retz. Obs. Bot. **5:** 22. 1789.
Rhaphis trivialis Lour. Fl. Cochinch. 553. 1790.
Chrysopogon aciculatus Trin. Fund. Agrost. 188. 1820.

Western Division: Daru Island, *Brass 6426;* troublesome weed on roadsides and town allotments.

India and southern China to the Philippines, New Guinea, Australia and Polynesia.

Heteropogon triticeus (R. Br.) Stapf, Kew Bull. **1912**: 432. 1912.

Andropogon triticeus R. Br. Prodr. Fl. Nov. Holl. 201. 1810.

Western Division: Mabaduan, *Brass 6538;* locally dominant on drier soils of savanna forest, a few culms in the clumps to 2.5 m. tall.

Ceylon, Java, the Philippines, New Guinea and Australia.

Themeda australis (R. Br.) Stapf in Prain, Fl. Trop. Afr. **9**: 420. 1919.

Anthisteria australis R. Br. Prodr. Fl. Nov. Holl. 200. 1810.

Central Division: Port Moresby, 200 m. alt., *Brass 8782;* open savanna forest; dominant grass on stony hillsides; clumps 1.5–2 m. tall.

Australia.

Themeda frondosa (R. Br.) Merr. Dept. Agr. Nat. Res. Bur. Sci. Manila Publ. No. **9**: 89. 1917.

Anthisteria frondosa R. Br. Prodr. Fl. Nov. Holl. 200. 1810.

Western Division: Mabaduan, *Brass 6474;* locally abundant on sandy soil in savanna forests.

Indian Archipelago to New Guinea and New Caledonia.

United States National Herbarium,
Washington, D. C.

COMBRETACEAE OF THE 1936 ARCHBOLD EXPEDITION (FLY RIVER, BRITISH NEW GUINEA)

A. W. Exell

Combretum trifoliatum Vent., Choix de Pl. t. 58 (1808).

Western Division: Middle Fly River, Lake Daviumbu, fl. Sept. 1936, *L. J. Brass 7709,* rain-forest; large scrambling shrub, plentiful on shores of lake.

This species is widespread in the Indo-Malayan region from Assam and Indo-China to New Guinea, but it is apparently absent from the Philippines. The specimen collected extends the known range of the species southwards, as the only other New Guinea records are from the Sepik region in the north-east, in the former German colony.

Quisqualis indica L., Sp. Pl. ed. 2, **1:** 556 (1762).

Western Division: Lower Fly River, east bank opposite Sturt Island, fl. Oct. 1936, *L. J. Brass 8198,* scrambling on river-banks and commonly climbing to the tops of tallest forest-trees; flowers white, later red.

This species, often cultivated in the tropics, is indigenous in the Indo-Malayan region and undoubtedly wild in New Guinea.

Terminalia Catappa L., Mant. **1:** 128 (1767).

Western Division: coast between Oriomo and Fly Rivers, fl. March 31, 1936, *L. J. Brass 6416,* one of the chief components of beach-forests; large spreading tree with thick tessellate bark; flowers white.

Widespread coastal species in the Indo-Malayan and Polynesian regions; often planted in other parts of the Tropics.

Terminalia Copelandii Elm., Leaflets Philipp. Bot. **5:** 1759 (1913).

Western Division: Lower Fly River, east bank opposite Sturt Island, fl. Oct. 1936, *L. J. Brass 8027,* very conspicuous flat-topped tree towering above general level of the flood-plain forests; trunk heavily buttressed; bark thick, brown, long-fissured, peeling in small suberose scales; wood brown, tough; flowers white; tree bare of leaves in Sept.-Oct.

If this is correctly identified it is an interesting discovery of a species hitherto known, as far as I am aware, only from Palawan, Philippine

Islands, where it grows in the coastal forests, presumably in very similar conditions to those in which it was found growing by Brass in Papua. The leaves, inflorescences and twigs agree very well with the Palawan species but in the absence of fruit, often of great taxonomic value in this genus, the identification must remain doubtful.

Terminalia cf. **Kaernbachii** Warb. in Bot. Jahrb. **18:** 201 (1893), ex descr.

WESTERN DIVISION: Palmer River, two miles below the junction of Black River, fr. June, 1936, *L. J. Brass 6973*, common, very conspicuous tree in riverine forests, 35 m. tall, straight bole, flange-buttressed base; bark grey flaky, inner purplish; leaves at ends of branchlets; fruits red, fleshy, sessile, solitary on peduncle.

I have seen no specimen of *T. Kaernbachii* but *Brass 6973* agrees well with the description except that the fruit is a little smaller than in *T. Kaernbachii* (6.5 cm. long instead of 8 cm. long) and more flattened. *Terminalia Kaernbachii* is endemic to New Guinea.

Terminalia aff. **edulis** Blanco, Fl. Filip. ed. 2, 265 (1845).

WESTERN DIVISION: two miles below junction of Black River, fr. June, 1936, *L. J. Brass 6970*, tree 20 m., leaves thin, red when old, fruit green, compressed, about 2 cm. long, 1 cm. in diam.; same locality, fr. July, 1936, *L. J. Brass 7288*, principal primary forest tree on sandy silt-loams of river flood-plains, up to 30 m. tall with well-developed flank-buttresses; bark thin, fibrous, suberose, with vertical furrows; same locality, fl. July, 1936, *L. J. Brass 7350*, abundant in forests of lower ridges; large semi-deciduous canopy-tree; trunk spur-buttressed; bark brown, thin, flaky, wood pale, of cedar-like appearance, leaves, (still young) concave; flowers white; Fly River, between junctions of Alice and Elevata Rivers, fr. Aug., 1936, *L. J. Brass 7388*, semi-deciduous tree attaining to 20 m., on river-banks.

These specimens show a close general resemblance to *T. edulis* Blanco, a common species in the Philippine Islands. The Papuan specimens, however, have a sparser indumentum at all stages, the leaves, petioles and twigs becoming practically glabrous. Collections from intermediate regions are required to show whether the range and variation are discontinuous or not.

Terminalia hypargyrea Laut. & K. Schum., Fl. Deutsch. Schutzgeb. Südsee, 467 (1901).

Terminalia sogerensis Bak. f. in Jour. Bot. **61**, Suppl.: 14 (1923).

WESTERN DIVISION: Middle Fly River, Lake Daviumbu, fl. Sept.,

1936, *L. J. Brass 7782,* rain-forest, occasional near shores of lake; tree with spur-buttressed stem; bark thin, brown, exfoliating in thin suberose flakes; Lower Fly River, Gaima, fr. Nov., 1936, *L. J. Brass 8315,* substage tree 12 m. high, in light rain-forest; bark thin, suberose, slightly fissured; fruit red, compressed; Wassi Kussa River, Tarara, fr. Dec., 1936, *L. J. Brass 8551,* gallery extensions of rain-forest; tree 10–12 m.; branches horizontal; bark hard, fissured; wood yellow; fruit red, fleshy, covered with purplish bloom.

Endemic to New Guinea.

Terminalia cf. **complanata** K. Schum. & Hollr., Fl. Kais. Wilh. Land, 83 (1889).

Western Division: Daru Island, fr. April, 1936, *L. J. Brass 6433,* uncommon in rain-forest canopy-layer; large spur-buttressed tree, 20 m. high, spreading crown; bark yellow-brown, laminated, fibrous within, very thin pale brown outer corky later, wood tough, fibrous, stains paper yellow.

This differs from typical *T. complanata* in having a persistent ferruginous-sericeous indumentum on the branchlets and lower surfaces of the leaves. *Terminalia complanata* shows traces of a similar indumentum on the young parts but is rapidly glabrescent.

Terminalia complanata has been recorded from New Guinea and the Solomon Islands.

Terminalia crassifolia Exell, sp. nov.

Arbor ad 8 m. alta, ramulis 4–6 mm. in diam. crassis primo pubescentibus demum glabrescentibus. *Folia* ad apicem ramulorum conferta, petiolata, petiolo ± applanato, 7–13 mm. longo, primo sericeo demum appresse puberulo, lamina subcoriacea obovata apice rotundata nonnunquam breviter apiculata basi plerumque cuneata paullo inaequilaterali, 6–11 × 3.5–7.5 cm., supra minute inconspicue pustulata ceteroque glabra subtus ad nervos sparse appresse puberula ceteroque fere glabra, costa media subtus prominente, nervis lateralibus utrinque 9–11. *Flores* sessiles in spicas axillares ad 11 cm. longas dispositi, rachi pubescente. *Receptaculum* superius campanulatum (lobis inclusis) 3.5 × 2.5 mm., glabrescens, lobis (sepalis) deltoideis, 1.3 × 1.3 mm., glabris, inferius 2 mm. longum dense sericeum. *Discus* 4.5 mm. in diam. dense pilosotomentosus. *Stamina* 10, antheris subglobosis, 0.8 mm. in diam., filamentis 3 mm. longis. *Stylus* 4 mm. longus. *Fructus* ellipsoideus leviter compressus, in sicco 1.2–1.3 × 7–8 mm., primo dense demum sparse appresse puberulus.

WESTERN DIVISION: Mabaduan, fl. & fr. April, 1936, *L. J. Brass 6478* (Typus in Herb. Mus. Brit.), common in light rain-forests on granite slope, densely foliaged, horizontally branched tree, 6–8 m. tall, ripe fruit dark purple, somewhat compressed ± 1.5 cm. long, 1 cm. in diam.; Mabaduan, young fr., April, 1936, *L. J. Brass 6527,* common in savannah-forest substage; small tree, 7–8 m. high; unripe fruit compressed, minutely puberulent.

This species is very near to *T. Muelleri* Benth. from Queensland and the islands in the Gulf of Carpentaria. It differs in having a sericeous lower receptacle (glabrous in the Australian species) and slightly smaller fruits.

Terminalia sp.

WESTERN DIVISION: Lower Fly River, east bank, opposite Sturt Island, fl. Oct., 1936, *L. J. Brass 8048,* rain-forest; large spur-buttressed tree, common on lower ridges; bark brown, flaky-scaly, yellow when cut; wood yellow; flowers green; branchlets and petioles glaucous.

This is apparently a new species but I do not care to describe it without fruits. The leaves are similar to those of *T. papuana* Exell (but with longer petioles) and of *T. solomonensis* Exell.

Lumnitzera littorea (Jack) Voigt, Hort. Suburb. Calc. 39 (1845).

Pyrrhanthus littoreus Jack, Malay. Misc. II, 7: 57 (1822).

WESTERN DIVISION: Daru Island, fl. 29 Feb., 1936, *L. J. Brass 6228,* open places in better-drained parts of mangroves; shrub or small tree to 5 m.; bark rough, reddish brown; flowers white; Wassi Kussa River, Tarara, fl. & fr., Jan., 1937, *L. J. Brass 8691,* common small tree in mangroves; bark rough, fissured; flowers red.

This species occurs in mangrove-formations in tropical Asia, tropical Australia and Polynesia.

BRITISH MUSEUM, NATURAL HISTORY,
LONDON.

ENUMERATION OF THE ARALIACEAE COLLECTED BY L. J. BRASS IN NEW GUINEA[1]

H. HARMS

Boerlagiodendron forsan aff. **B. Ledermannii** Harms in Bot. Jahrb. **56:** 383 (1921).

Fly River, 528 mile Camp, 80 m. alt. Common along edge of forest on muddy banks of river. Sparsely branched tree 2–4 m.; inflorescence purple. May, 1936; *L. J. Brass 6794.*

Boerlagiodendron aff. **B. stenolobum** Harms, l. c. 382.

Palmer River, 2 miles below junction Black River, muddy banks of sluggish backwater creeks. Sparsely branched shrub 2–3 m.; inflorescence purple. June, 1936; *L. J. Brass 7056.*

Specimen lobis folii latioribus differt.

Boerlagiodendron (folium).

Fly River, 528 mile Camp, 80 m. alt. Common along edge of forest on muddy banks of river. Sparsely branched tree 2–4 m.; inflorescence purple. May, 1936; *L. J. Brass 6794.*

Schefflera macrostachya (Benth.) Harms; cf. Harms in Bot. Jahrb. **56:** 389 (1921).

Rona, Central Division, 450 m. alt. Common on or about rocks outside rain forest in Laloki River gorge. Tree to 12 m. tall, few thick branches, erect or nearly erect, at apex large leaves; petiole near 1 m. long; persistent stipule; flowers red, in stout terminal panicle 20–30 cm., erect above leaves. Feb., 1936; *L. J. Brass 6209.*— Upper Wassi Kussa River (left branch), Western Division; rain forest, epiphyte on riverbank trees. Tree 6–8 m., branches of inflorescence spreading when in fruit; flowers red; fruits black, fleshy. January, 1937; *L. J. Brass 8618.*

Species in Papuasia late distributa.

Schefflera Rudolfi Harms, l. c. 394.

Palmer River, 2 miles below Black River Junction, 100 m. alt. Sparsely branched shrub (epiphytic), found near ground in all types of rain forest. April, 1936; *L. J. Brass 6891.*— Same locality. Unbranched

[1]Botanical Results of the Archbold Expeditions.

shrub, 1.5 m. h.; terrestrial in forest undergrowth; fruit red. June, 1936; *L. J. Brass 7055*.

Specimina pedunculis longioribus a typo diversa.

Schefflera venulosa (W. & A.) Harms; cf. Harms, l. c. 406.

Lower Fly River, east bank opposite Sturt Island; rain forest. High climbing liane, common on ridges; panicle yellow; ripe fruit red. October, 1936; *L. J. Brass 8040*.

Schefflera Versteegii Harms, l. c. 403.

Palmer River, 2 miles below Black River Junction, 100 m. alt. Arborescent epiphyte in ridge forest; stem unbranched; panicle terminal, 40 cm. long., with many radial branches; flowers green. July, 1936; *L. J. Brass 7296*.

Schefflera Brassii Harms, sp. nov.

Frutex epiphyticus magnus; folia magna digitata, vagina lata crassa setis laciniiformibus obsita, petiolo in folio unico suppetante glabro 55 cm. longo, apice nodoso-incrassato; foliola 5 (probaliter plura, forsan 7–9), oblongo-oblanceolata vel anguste oblonga, basi angustata rotundata vel obtusa, apice acuminata, chartacea, glabra, nervis lateralibus utrinque circ. 7–11 cum costa subtus prominulis inter se spatio lato distantibus; panicula terminalis, ampla, pedunculo puberulo, bracteis lanceolatis setulis vel setis laciniiformibus obsitis, rhachi puberula 20 cm. longa, paniculas secundarias complures (8–10) racemiformes umbelluligeras 12–25 cm. longas gerente, rhachibus tenuibus puberulis; umbellulae racemose dispositae numerosae, parvae, pedunculis puberulis 6–7 mm. longis, ad basim florum parce pilosis, 7–10-florae, pedicellis 3–4 mm. longis, cum ovario fere 1.5 mm. longo glabris; corolla in specimine delapsa; stamina 5; discus leviter elevatus, stylis obsoletis.

PAPUA: Middle Fly River, Lake Daviumbu, September, 1936; *L. J. Brass 7746;* large epiphytic shrub, common in rain forests, flowers white.

Species floribus minimis in umbellulas parvas vel rhachin elongatam dispositis distincta.

Schefflera fimbriata (F. Muell.) Harms; cf. Harms in Bot. Jahrb. **56:** 402 (1921). — *Heptapleurum fimbriatum* F. Muell. (1877).

Fly River, 528 mile Camp, 80 m. alt. Common epiphytic shrub in river flood-bank forest. May, 1936; *L. J. Brass 6786*.— Palmer River, 2 miles below Black River Junction. Unbranched shrub 1 m. June, 1936; *L. J. Brass 6912*.— Same locality, 100 m. alt. Common low shrub on river-banks; fruit purple-red. July, 1936; *L. J. Brass 7239*.—

Same locality. Epiphytic, 2–3 m. above ground level on river-bank trees; unbranched shrub, 1.5 m.; flowers white. July, 1936; *L. J. Brass 7261.*

Flores haud in spicas dispositi (ut prius putavi), sed in umbellulas capituliformes ad rhachin elongatam subsessiles.

Polyscias Caroli Harms in Bot. Jahrb. **56:** 411 (1921).

Lake Daviumbu, Middle Fly River; edge of light rain forest. Sparsely branched shrub, 1–2 m. h.; flowers white. September, 1936; *L. J. Brass 7922.*— Gaima, Lower Fly River (east bank). Common in outskirts of rain forest. Shrub, 1–2 m.; branched or not branched. September, 1936; *L. J. Brass 8372.*— Tarara, Wassi Kussa River, Western Division. Common in inferior rain forest. Shrub 1–1.5 m.; ripe fruit, soft, black. January, 1937; *L. J. Brass 8740.*

Polyscias elegans (C. Moore & F. Muell.) Harms.

Tarara, Wassi Kussa River, Western Division. Tree 7–9 m. common in rain forest substage; inflorescence purple, anthers yellow. Terminal panicle about 40 cm. long. January, 1937; *L. J. Brass 8656, 8748.*

Polyscias Branderhorstii Harms in Bot. Jahrb. **56:** 412 (1921) forsan serius cum *P. elegans* conjugenda.

Anomopanax cf. **A. Schlechteri** Harms.

Palmer River, 2 miles below Black River Junction, 100 m. alt. Rare in forest undergrowth; plant unbranched, 60 m. high; flowers white. July, 1936; *L. J. Brass 7322.*

Anomopanax variaefolius C. T. White in Jour. Arnold Arb. **10:** 256 (1929).

Fly River, Oroville Camp. Epiphyte in forest; large fleshy sparsely branched shrub; leaves 80–90 cm. long; flowers cream-colored. August, 1936; *L. J. Brass 7409.*

Botanisches Museum,
Berlin-Dahlem.

PLANTAE PAPUANAE ARCHBOLDIANAE. I*

E. D. MERRILL AND L. M. PERRY

THIS PAPER is the first one of a series planned to include data on the assembled Papuasian material available at the Arnold Arboretum. The intention is to include, under various natural groups, descriptions of apparently hitherto undescribed species, records of those previously described from other regions but, so far as our records show, not before reported from the particular geographical area herein noted, and nomenclatural notes. Most of the data appertain to material assembled by the Richard Archbold Expeditions, through the activities of Mr. L. J. Brass who has served as botanist for the first three New Guinea expeditions. The very extensive collections assembled during the third expedition, which operated in the Netherlands New Guinea in 1938, have not yet been arranged for study. We have included data on other collections available to us, not only from New Guinea but also from the earlier L. J. Brass and S. F. Kajewski collections from the Solomon Islands. Our work has been greatly facilitated through the courteous loan of the extensive card index to New Guinea species prepared during the past six years at the New York Botanical Garden, covering the known literature appertaining to that large island. The types of the new species herein described, unless otherwise stated, are deposited in the herbarium of the Arnold Arboretum.

ULMACEAE

Parasponia paucinervia sp. nov.

Arbor parva, usque ad 7–8 m. alta; ramulis novellis subsericeis vel breviter villosis, demum glabris; foliis lanceolatis, 6–8.5 cm. longis, 2–3 cm. latis, sensim acuminatis, basi obtusis vel subrotundatis et interdum leviter inaequalibus, margine basi excepta dense crenato-serratis, supra asperulis, costa media nervisque primariis impressis, ± strigillosis, subtus costa, nervis venulisque strigosis ad strigillosis, nervis basalibus 3, lateralibus supra basin utrinque 1–2 valde ascendentibus; petiolo 7–11 mm. longo, dense subadpresse pubescente; stipulis in unam intrapetiolarem bicuspidatam extus praesertim in costis adpresse pubescentiam ± 4 mm. longam connatis; cymis axillaribus; floribus ♀

*Botanical Results of the Richard Archbold Expeditions.

tantum visis; perianthii laciniis 1 mm. longis, oblongis, obtusis, ciliolatis, puberulis; ovario obovoideo, apice lato, basi attenuato; stigmatibus 2, incurvis, intus pubescentibus; toro piloso; drupis parvis (2 mm. longis), ovoideis, stigmatibus marcescentibus coronatis, basi perianthio suffultis.

Solomon Islands: Guadalcanal Island, *Kajewski 2590* (type), April 26, 1931, rain-forest (rough barren country), at 200 m. alt., common (small tree up to 7 or 8 m. high; fruit about ¾ grown on the specimens).

This species is very much like *Parasponia parviflora* Miq. but differs in the fewer lateral nerves; the first lateral nerve above the base arises from the midrib about half way to the apex of the leaf. In *P. parviflora* Miq. the lateral nerves are twice as many and are rather evenly distributed along the midrib of the leaf. The specimen here described has only ♀ inflorescence.

Gironniera grandifolia sp. nov.

Arbor gracilis, 12–15 m. alta; ramulis glabratis; foliis ellipticis, 30–38 cm. longis, 13–16 cm. latis, apice obtusis? (apicibus foliorum deficientibus in specimine viso), basi rotundatis, inaequalibus, margine integris vel subdenticulatis, penninerviis, supra glabris, subtus nervis exceptis glabris; nervis ± adpresso-hirsutis, lateralibus 16–18, supra vix impressis, subtus prominentibus, reticulato-venosis; petiolo ± 8 mm. longo; stipulis 2, lineari-lanceolatis, adpresso-pilosis; inflorescentiis compactis (♀ 3 cm. longis, 4 cm. latis; ♂ immaturis, vix 1 cm. diametro), axillaribus vel lateralibus; floribus ♂ (alabastris immaturis tantum) sessilibus; staminibus 5, pistilli rudimento lineari-oblongo; floribus ♀ sessilibus; perianthio persistente, laciniis inaequalibus, acutis, vix 1 mm. longis; stylo ± 2 mm. longo; stigmatibus filiformibus, intus breviter velutinis, usque ad 17 mm. longis; drupis rotundato-ovatis, lenticularibus, minute strigillosis, (immaturis) 5 mm. longis, stylo stigmatum basique coronatis; putamine subrotundo (4 mm. longo, 5 mm. lato), leviter obliquo.

Solomon Islands: San Cristoval Island, Magoha River, *Brass 2731* (type), *2728*, August 25, 1932, rain-forests at 150 m. alt., common (slender loosely branched tree 15 m. tall; bark brittle, pale brown; leaves spreading horizontally, glossy above; flower brown).

This species is most like *Gironniera celtidifolia* Gaudich. but the leaves are larger and scarcely at all dentate near the apex, the inflorescence is somewhat less compact, the floral bracts are shorter and broader and only short-pilose as compared to the hirsute ones of the latter species; further the style and the stigmas in *G. grandifolia* are relatively longer

than those of *G. celtidifolia* Gaudich. (Gaudichaud's plate of *G. celtidifolia* shows stipules at more than one node as if persistent; the only collection of this species [?] which has definitely persistent stipules is from Ponape Island [*Kanehira 797*]; in this specimen also the leaf-bases are oblique and ± auriculate).

Gironniera subaequalis Planch. Ann. Sci. Nat. III Bot. **10:** 339. 1848, ? var. **papuana** J. J. Smith, Nova Guinea **8:** 892. 1912.

BRITISH NEW GUINEA: Lower Fly River, east bank opposite Sturt Island, *Brass 8174*, October, 1936, rain-forest of dry inland ridges (sub-stage tree 16–20 m. tall); Oroville Camp, Fly River, *Brass 7433*, August, 1936, common in rain-forest undergrowth (tree 6–7 m. high).

Both collections are in practically the same stage of development, yet the branchlets of *Brass 7433* are spreading-hirsute while those of *Brass 8174* are appressed-hirsute. In both, the leaves are predominantly ovate with a rounded and slightly oblique base; the apex of the older leaves is almost obtuse then abruptly produced into a slender acumen 4(–5) mm. broad at the base and 1.5 cm. long.

The species ranges from Ceylon to southern China, Malaysia, the Philippine Islands to Fiji. There is so much variation in the material that we have very hesitantly assigned our collections to the variety reported from New Guinea; however, a record of these two collections may be helpful to someone making a special study of the group. Without adequate material for comparison we have been unable to distinguish clearly the differences between *Gironniera subaequalis* Planch. and *G. amboinensis* Lauterb.; hence, we are somewhat hesitant in making this determination.

Gironniera celtidifolia Gaudich. var. **Hombroniana** Planch. in DC. Prodr. **17:** 207. 1873.

SOLOMON ISLANDS: Ysabel Island, Maringe, *Brass 3191*, November 23, 1932, limestone hills (much branched tree 6–8 m. tall; leaves stiff and slightly scabrous); Malaita Island, Asubiah, *Kajewski 2343*, December 11, 1930, rain-forest (fruit black when ripe).

These collections seem to be sufficiently different from the typical form of the species to warrant giving them some particular designation. We have placed them under the above variety which was described from the Solomon Islands.

Gironniera retinervia sp. nov.

Arbor 10–15 m. alta; ramulis sparse strigosis; foliis ellipticis, acuminatis, basi inaequalibus obtusisque, 7–13 cm. longis, 3–5 cm. latis,

margine denticulatis vel subintegris, supra glabris, sub lente reticulatis, subtus praecipue costa media nervisque primariis sparse strigillosis, valde reticulatis; petiolo ± 7 mm. longo, strigilloso; stipulis linearibus, 1.5 cm. longis; inflorescentiis ♂ axillaribus, (immaturis) compactis; staminibus 5; inflorescentiis ♀ axillaribus, plerumque geminatis, simpliciter racemosis, (in specimine) usque ad 3.5 cm. longis; floribus sessilibus vel breviter pedicellatis; perianthio persistente, laciniis 4(?), late ovatis, vix 1 mm. longis; drupis (immaturis) scabridis, rotundato-ovatis (4 mm. longis, 5 mm. latis), lenticularibus, stylo stigmatum basique coronatis; stylo 1.5 mm. longo; stigmatibus 2, filiformibus, circiter 8 (?) mm. longis.

Solomon Islands: Bougainville Island, Kupei Gold Field, *Kajewski 1646* ♀ (type), April 8, 1930, rain-forest, at 950 m. alt., common; San Cristoval Island, Hinuahaoro, *Brass 2873* ♂, September 16, 1932, mountain-forests, at 900 m. alt., common (large shrub; the lower surface of the leaves scabrous, the upper shining).

The general habit of this species is somewhat similar to that of *Gironniera subaequalis* Planch., but the leaves are smaller, very oblique at the base and strongly reticulate on both surfaces, and the style and stigmas are shorter than in the latter species.

NYCTAGINACEAE

Ceodes umbellifera J. R. & G. Forster, Gen. Plant. 142, *t. 71.* 1776; Skottsberg, Svensk Bot. Tidskr. **30:** 723. 1936.

Solomon Islands: Bougainville Island, Kugumaru, Buin, *Kajewski 1990,* common in rain-forest at 150 m. alt. Malay Archipelago to Polynesia including Hawaii, but not specifically reported previously from the Solomon Islands.

Ceodes corniculata (Bargagli-Petrucci) comb. nov.

Pisonia corniculata Bargagli-Petrucci, Nuov. Giorn. Bot. Ital. II. **8:** App. 615. 1901.

Calpidia corniculata Heimerl, Oesterr. Bot. Zeitschr. **63:** 283. 1913.

British New Guinea: Fly River, 528 Mile Camp, *Brass 6789,* May, 1936, at 80 m. alt., characteristic forest undergrowth on muddy banks of backwater creeks cutting the river flood-banks (tree of open, rather weak, branching habit, attaining 5–7 m.; leaves glabrous, of soft texture). Described from New Guinea, and reported by Heimerl from Batjan in the Moluccas.

With only the original description of this species for comparison, we

hesitate to assign this collection (with ♂ flowers and immature fruit) elsewhere, although some leaves are much larger (up to 33 cm. long, 11 cm. broad) than in the original, and the lateral nerves are only 7–8.

Ceodes longirostris (Teysm. & Binn.) comb. nov.

Pisonia longirostris Teysm. & Binn. Nat. Tijdschr. Nederl. Ind. **25**: 401. 1863; Valeton, Ic. Bogor. **1**: 69, *t. 21* (fig.), *22* (descr.). 1897.
Calpidia longirostris Heimerl, Oesterr. Bot. Zeitschr. **63**: 287. 1913.
Pisonia triandra Bargagli-Petrucci, Nuov. Giorn. Bot. Ital. n. ser. **8**: App. 610. 1901.
Pisonia Beccariana Bargagli-Petrucci, op. cit. 612.
Calpidia triandra Heimerl, op. cit. 289.

BRITISH NEW GUINEA: Fly River, 528 Mile Camp, *Brass 6639*, May, 1936, occasional in moist deeply shaded forest (sparsely branched spreading shrub ± 2 m. high; leaves clustered at intervals along the branches; masses of slender rootlets produced in leaf-axils which collect humus from falling leaves of forest trees; flowers small, brown; fruit [young] ± 40 cm. long, viscid); Palmer River, 2 miles below Black River Junction, *Brass 7196*, July, 1936, at 100 m. alt., gregarious in practically pure stands on points of low ridges abutting on river-flat (erect shrub, branched or unbranched, ± 1 m. high; flowers brown; fruit viscid); Lower Fly River, east bank opposite Sturt Island, *Brass 8036*, October, 1936, occasional in flood plain river-forest; Central Division, Dieni, Ononge Road, *Brass 3912*, April 29, 1933, at 500 m. alt., in rain-forest (slender tree 20 m. tall; leaves dull, thick, margin narrowly recurved; flowers brown). Described from Boeroe in the Moluccas, apparently common in New Guinea.

In the collection *Brass 8036* some leaves are 80 cm. long and 19 cm. broad, the apex in the leaves of all the collections is variable, some leaves being rounded whereas others are obtuse to bluntly acuminate.

From the Solomon Islands we have two very similar collections with somewhat smaller leaves and young flowers only: Bougainville Island, Kieta, *Kajewski 1612*, March 29, 1930, rain-forest, at 100 m. alt., common (shrub up to 3 m. high); Ulawa Island, *Brass 2966*, October 5, 1932, rain-forest on slopes of central mountain, at 200–300 m. alt., common (small, crooked, branched tree; leaves fleshy; flowers brown).

On account of the similarity in flowering specimens (indicated by Valeton, Bot. Jahrb. **52**: 103. 1914) of *Ceodes longirostris* (Teysm. & Binn.) and *Pisonia spathiphylla* K. Schum., and the lack of corresponding fruiting material from the Solomon Islands, we have hesitated to give these more than a provisional designation.

Ceodes urocarpa sp. nov.

Arbor parva; ramulis griseis, glabris; foliis ellipticis ad obovato-ellipticis, (in specimine) 12–31 cm. longis, 6–11 cm. latis, paullo supra dimidiam latissimis, basim versus cuneatim angustatis, apice obtusis ad acutis, chartaceis, in sicco supra nigrescentibus, subtus pallidioribus; nervis primariis utrinque 8–11, undique perspicuis, intra marginem arcuatim confluentibus; petiolo 1.2–2.5 cm. longo; inflorescentiis terminalibus axillaribusque, laxe paniculatis, divaricate ramosis, foliis brevioribus; pedunculo 1–3 cm. longo, glabrato; ramulis ultimis et pedicellis floribusque indumento pulverulento brunneis; floribus ♂ (immaturis) ad apicem ramulorum ultimorum umbellatim congestis; perianthio ± 3 mm. longo, 5-lobulato; staminibus 4, tubo perianthii aequilongis; filamentis glabris; antheris suborbicularibus; stylo filamentis fere aequilongo; stigmate vix fimbriato; floribus ♀ non visis; fructibus lanceolato-teretibus, basi in stipitem paullo productis, apice in rostellum longissimum filiformem in sicco vix sulcatum abientibus, summo apice perianthii limbo vix aucto coronatis; fructu cum stipite rostelloque ad 60 cm. longo, immaturo sine rostello 2 cm. tantum, supra basim 1 cm. lato; pedicello fructifero 1–1.5 cm. longo.

Solomon Islands: Ulawa Island, *Brass 2972* (type), October 6, 1932, common in littoral rain-forests (small trees with smooth shining somewhat fleshy leaves; the long green tail-like appendage of the fruit very viscid. Quite large birds are frequently entangled and held by the viscid fruit).

Particularly in the long rostellate fruits, but also somewhat in the outline of the leaves, the species suggests *Ceodes longirostris* (Teysm. & Binn.), but it appears to be quite distinct by the much narrower leaf-base and the much longer petiole.

LEGUMINOSAE

(E. G. Baker)

Adenanthera novo-guineensis Bak. fil. sp. nov.

Arbor parva ± 14 m. alta ad *A. pavoninam* L. accedens, differt primo intuitu pedicellis brevioribus hirtis, seminibus fere omnino rubris ± 5 mm. longis, conspicue minoribus, leguminibus contortis nec falciformibus, petalis brevioribus. Folia bipinnata 23–27 cm. longa; pinnae 4–5-jugae, 10 cm. longae; foliolis alternis utrinque 5–7 brevissime petiolulatis, oblongis vel ovato-oblongis, apice obtusis vel emarginatis, basi rotundatis, 15–28 mm. longis, 10–15 mm. latis, subtus adpresse et sparse pubescentibus. Flores lutei, in multifloros racemos dispositi.

Pedicelli ± 1 mm. longi, hirti. Petala ± 3 mm. longa lanceolata vel oblongo-lanceolata. Stamina exserta. Ovarium hirtum. Legumen oblongo-lineare contortum, ± 10 cm. longum, 13–16 mm. latum, 10–13-spermum seminibus fere omnino rubris levissime apicem versus nigris ± 5 mm. longis.

Type, *L. J. Brass 8367,* collected Nov. 1936 at Gaima, Lower Fly River (east bank), Western Division, British New Guinea; rain-forest outskirts; tree 14 m. high, flowers yellow. Type in British Museum (Natural History). Also: Lake Daviumbu, Middle Fly River, *Brass 7763;* small canopy tree, common in light rain forest.

Differs from *A. pavonina* L. by the shorter pedicels and conspicuously smaller seeds which are nearly all red but just tipped with black; from *A. borneensis* Brace by the blunt apices of the leaves; from *A. Forbesii* Gagnep. by the much larger leaflets and from *A. atrosperma* F. Muell., *A. intermedia* Merr., *A. aglaosperma* Alston and *A. microsperma* Teijs. & Binn by the seed being of different shape, only just tipped with black and 5 mm. long.

RUTACEAE

Zanthoxylum torvum F. v. Muell. Fragm. **7:** 140. 1871; F. M. Bailey, Queensl. Fl. **1:** 205. 1899; Merr. Enum. Philip. Fl. Pl. **2:** 327. 1923.

Fagara torva Engler in Engler & Prantl, Nat. Pflanzenfam. **3**(4): 119. 1895; Merr. Interpret. Herb. Amboin. 288. 1917.

British New Guinea: Central Division, Ononge Road, Dieni, *Brass 3833,* April 21, 1933, at 500 m. alt., rain-forest (very slender, high climbing liane with very glossy pinnate leaves paler beneath; fruit red; seeds shining, black); Lower Fly River, east bank opposite Sturt Island, *Brass 7983,* October, 1936, rain-forest canopy (liane common on drier ridges; stem and branches thorny).

These specimens are a good match for the collections from Amboina. The lower surface of the leaves tends to be pubescent along the nerves, and the leaf-serrations are somewhat variable. The species has been found in Australia, Amboina, Java, and the Philippines.

Flindersia amboinensis Poir. in Lam. Encycl. Suppl. **4:** 650. 1816; C. DC. Monog. Phan. **1:** 735. 1878; Merr. Interpret. Herb. Amboin. 291. 1917.

Flindersia radulifera Spreng. Gesch. Bot. **2:** 76. 1818.

British New Guinea: Central Division, Kubuna, *Brass 5565,* November, 1933, at 100 m. alt., common in ridge-forests; Mafulu,

Brass 5339, oak forest, at 1250 m. alt. (heavy boled tree with pale brown, fissured bark; leaves very glossy; flowers small, red); Western Division, Upper Wassi Kussa River (left branch), *Brass 8634,* January, 1937, rain-forest canopy; Lower Fly River, east bank opposite Sturt Island, *Brass 8032,* October, 1936, rain-forest, one of the commoner large trees of dry ridges inland from the river; Lake Daviumbu, Middle Fly River, *Brass 7517,* August, 1936, rain-forest, common.

This species was based on the Rumphian description and plate of *Arbor radulifera* Rumph. Herb. Amb. **3:** 201, *t. 129.* 1743, which in turn was based on Amboina specimens (not Ceram as indicated by C. de Candolle). It is cultivated in the Botanic Gardens at Buitenzorg. Hemsley reports a fruit cast up on the coast of Aru Island. It seems probable that it is rather widely distributed in the Moluccas and New Guinea.

Brass describes this as a common spur-buttressed tree of the ridge-forests, 20–30 m. tall, with bark gray-brown to brown outside, yellow within, fissured horizontally and exfoliating in small scales; leaves dark green with pale nerves; flowers red; and fruit (in *Brass 7517* solitary on peduncles, pendent) 5-valved, valves 11.5–15 cm. long, 2 cm. broad.

Our material seems to correspond fairly well with the description of *Flindersia amboinensis* Poir. Rumphius indicated that the flowers appeared in December, and the fruit-valves were 5–6 inches long. *Brass 8634* (with flowers) was collected in January. Briefly, the flowers are red; the calyx pubescent; the sepals 5, rounded-ovate, ± 1 mm. long; the petals obovate-oblong, glabrous, ± 3.5 mm. long; the filaments shorter than the petals, thickish; the anthers broadly ovate-cordate; the staminodia a little longer than the disc, acute; and the ovary pubescent.

Without examining the actual fruit of *Flindersia papuana* F. v. Muell. from the Fly River, we cannot say whether any of our material represents that species. Both *F. Bennettiana* and *F. Oxleyana* which von Mueller says are "not dissimilar . . . in tubercular roughness," have capsules with large and small tubercles; whereas, the protuberances or tubercles of the fruits in these collections (cited as *F. amboinensis* above) are fairly regular in size, much like those on the fruit-valves of *F. australis* R. Br. but somewhat blunter.

Flindersia heterophylla sp. nov.

Arbor 20 m. alta; ramulis cinereo-fuscis; foliis suboppositis, 1–4-foliolatis, rachi 3–8 cm. longa; foliolis suboppositis, subcoriaceis, 5.5–13 cm. longis, 2–6.8 cm. latis, ellipticis, coriaceis, breviter petiolulatis (petiolulis 2–5 mm. longis), apice abrupte obtuseque breviter

acuminatis vel obtusis, basi cuneatis vel acuminatis, supra nitidis, utrinque glabris, margine integris; costa media utrinque prominula praecipue basim versus; venulis primariis ± 9, inconspicuis; paniculis amplis; pedunculis secondariis oppositis; ramulis glabratis; alabastris pubescentibus; floribus rubris; sepalis late ovatis, 0.7 mm. longis; petalis obovato-oblongis, 2 mm. longis, undique pubescentibus; filamentis crassis, 0.8 mm. longis, dorso pubescentibus; antheris cordatis; staminodiis inconspicuis; ovario hirsuto; capsulis ± 5.5 cm. longis; valvis dorso verrucosis, leviter tuberculatis; seminibus ± 4.3 cm. longis, ellipticis, utrinque alatis.

BRITISH NEW GUINEA: Western Division, Wassi Kussa River, Tarara, *Brass 8495* (type, fruiting branchlet), *8542* (flowering branchlet), December, 1936 and January, 1937, common in rain-forest (canopy tree attaining 20 m., with close brown bark marked with shallow horizontal fissures; wood pale, tough; leaves 1–2–3 or 4-foliolate; flowers red).

Without actual material for comparison, we believe this species is perhaps most nearly related to *Flindersia Brayleyana* F. v. Muell. It differs, however, in its less numerous and more nearly sessile leaflets, different colored flowers, less pointed anthers (cf. Engler & Prantl, Nat. Pflanzenfam. **3**[4]: 171, *f.99J-Q.* 1895), and more shortly pubescent filaments, as well as in the shorter and inconspicuous staminodia. The capsule also seems to be different; in our species the boundary lines of the incipient tubercles are somewhat indefinite and the surface tends to show irregular rounded ridges or mounds rather than the definite pointed tubercles characteristic of the related species.

Flindersia brachycarpa sp. nov.

Arbor ± 25 m. alta; ramulis cylindricis, atro-fuscis; foliis oppositis vel suboppositis, pari-pinnatis, 8–10-foliolatis, rachi (incl. petiolo) 12–19 cm. longa; foliolis oppositis, subcoriaceis, conspicue petiolulatis (petiolulis 7–9 mm. longis), inaequilateraliter lanceolato-ellipticis, 6–11 cm. longis, 3–4 cm. latis, subacutis, basi rotundato-cuneatis, utrinque glabris, margine integris; venis primariis usque ad 20, supra inconspicuis, subtus perspicuis sed non prominulis; paniculis amplis, pedunculis secondariis oppositis, ramulis pubescentibus; alabastris pubescentibus; sepalis ovatis, ± 1 mm. longis; petalis oblongis, ± 2.5 mm. longis, intus glabris; staminibus brevibus; filamentis 0.4 mm. longis, antheris ovatis, apiculatis; staminodiis 5, 0.4 mm. longis, acutiusculis; disco undulato; capsulis 5.5–6 cm. longis; valvis dorso obtuse et breviter tuberculatis; seminibus ignotis.

British New Guinea: Western Division, Wassi Kussa River, Tarara, *Brass 8389* (type), December, 1936, rain-forest (important canopy tree 25 m. tall; stem cylindrical; bark dark, very thick, rough and fissured; wood yellow; rachis of leaves decurrent; flowers white; capsules brown, pubescent).

This species strongly suggests *Flindersia Ifflaiana* F. v. Muell. It differs in having larger leaves with the leaflets strongly oblique at the base and more acute at the apex, and a little larger fruits.

AQUIFOLIACEAE

Ilex cristata sp. nov.

Ramuli cinerei usque gilvi, novelli ± angulati, fusci, copiose puberuli; foliis coriaceis, 2–3 cm. longis, 0.9–1.3 cm. latis, ovatis, basi late obtusis usque cuneatis, apicem versus paullo angustatis, apice late acuminatis, margine fere integris, apicem versus 2–4-serrulatis, in sicco supra fuscis, subtus pallidioribus et consperse glandulosis, costa media supra canaliculata, subtus prominula; venis primariis obscuris; petiolo 3–4 mm. longo; inflorescentiis in foliorum axillis solitariis vel plerumque racemosis, rachi ± 5 mm. longa, pedicellis 2 mm. longis, basi bracteatis, bracteis late ovatis, circiter 0.5 mm. longis; sepalis 5, persistentibus; drupis depresso-ovoideis usque subglobosis, circiter 3 mm. diametro, parte inferiore farinacea, stigmate prominulo oblongo (2 mm. longo, 0.5 mm. lato) coronatis, circa 18-pyrenis; pyrenis convexo-trigonis, 1.5 mm. longis, 1 mm. latis (immaturis).

Northeastern New Guinea: Torricelli-Gebirge, *Schlechter 20180* (type), September 11, 1909, at 800 m. alt.

The label of the above cited specimen bears the determination *Bulbophyllum quinquelobum* Schlecht.; this is undoubtedly a clerical error as Schlechter's type is no. *20188* of this same series.

A comparison of *Ilex cristata* with the description of *I. pseudoembelioides* Loes. suggests that our species is closely allied. It differs, however, in having less conspicuous leaf-venation, racemose inflorescences, and a rather distinctive stigma resembling a narrow and slightly elongated crest-like ridge at the apex of the drupe.

Ilex Archboldiana sp. nov.

Arbor usque ad 15 m. alta; ramis dense foliatis, subteretibus (fere angularibus), cineraceis, novellis fuscis et saepe puberulis; foliis valde coriaceis, nitidis, 1.5–3.5 cm. longis, 1–2 cm. latis, obovatis ad ellipticis, basi late subcordatis, apice obtusis vel retusis, interdum mucronulatis, margine integerrimis valde revolutisque, glabris, supra viridibus, subtus

pallidioribus; nervis primariis utrinque 3–4, prominulis vel indistinctis; petiolo circiter 5 mm. longo, minute puberulo, fusco; floribus ♀ solitariis vel inflorescentiis 3–5-floris (cymoso-umbellatis) in axillis foliorum superiorum, pedunculo ± 6 mm. longo, puberulo; pedicellis circiter 3 mm. longis, puberulis; sepalis 5, rotundis, puberulis; baccis subglobosis, in sicco 3–4 mm. diametro, 4-pyrenis.

BRITISH NEW GUINEA: Central Division, Mount Tafa, *Brass 4118, 4897* (type), May-September, 1933, at 2300–2400 m. alt., common in ridge-forests; Wharton Range, Murray Pass, *Brass 4601,* June-September, 1933, at 2480 m. alt.

According to Brass this is a compact densely foliaged tree with very stiff, smooth, shining convex leaves; fruit 4–5 mm. diameter, subglobose, and red with red seeds.

Ilex Archboldiana closely approaches *I. revoluta* Stapf from Borneo in general habit; nevertheless, it may be distinguished by the grayish white branchlets, the fuscous puberulent branchlets (new growth), and the entire leaves not glandular-punctate beneath. The ♀ inflorescence is axillary and consists of a solitary flower (incipient umbel, the two bracts on the peduncle indicating abortive flowers), or flowers in umbels of 3, or occasionally a cymose umbel with 4–5 flowers.

Ilex Brassii sp. nov.

Arbor usque ad 20 m. alta; ramis teretibus, atro-cinereis; foliis coriaceis, 5–9 cm. longis, 3–5.5 cm. latis, ellipticis, basi ± rotundatis vel obtusis, apice breviter lateque acuminatis usque obtusis, margine integris; costa media supra canaliculata, subtus prominente; venis primariis utrinque ± 6, prope margine arcuatis, supra inconspicuis, subtus vix prominulis; petiolo ± 1 cm. longo; inflorescentiis ♂ axillaribus, 2 cm. longis, paniculatis; floribus racemosis vel subumbellatis, 4-meris; calyce patelliformi, lobis rotundatis, minute ciliolatis; petalis oblongis; staminibus petalis paullo brevioribus; antheris oblongis; pistillodio conico.

BRITISH NEW GUINEA: Gaima, Lower Fly River (east bank), *Brass 8291* (type), November, 1936, common about margins of sago-swamps in the rain-forest (tree 20 m. high; bark thick, gray, suberose, fissured, green when cut; most trees in young bud). NORTHEASTERN NEW GUINEA: Sattelberg, *Clemens 3034.*

This species somewhat resembles *Ilex Ledermannii* Loes. var. *elliptica* Loes. in habit; but the ♂ inflorescence has a much shorter peduncle than that of the ♀ inflorescences in our material of the above named variety; the latter also appears (from the calyx on the fruit) to have a 5-merous flower.

CELASTRACEAE

Gymnosporia inermis sp. nov.

Frutex magnus, 3 m. altus, glaber, scandens; ramulis fusco-cinereis, divaricatis; foliis 3.5–8 cm. longis, 2–5 cm. latis, obovatis, apice rotundatis vel retusis, basi cuneatis ad ± rotundatis, margine crenulatis; costa media venisque primariis (utrinque ± 5–6) utrinque prominulis, venulis laxe reticulatis, fere prominulis; petiolo 3–8 mm. longo; inflorescentiis in foliorum axillis solitariis vel in ramulorum abbreviatorum apice 1–5, saepe bis dichotome furcatis, pedunculatis, pedunculis ± 1 cm. longis, pedicellis ultimis ± 4 mm. longis; bracteis lanceolatis; floribus 5-meris, sepalis semi-orbicularibus; petalis oblongo-ovatis, obtusis, circiter 2.5 mm. longis; capsula trivalvi, valvis ± 7 mm. longis; loculis 2-spermis (immaturis).

British New Guinea: Western Division, Wassi Kussa River, Tarara, *Brass 8690* (type), January, 1937, common in inner mangroves (stiff scandent shrub; flowers white; fruit immature); Daru Island, *Brass 6229,* March 29, 1936, on slightly raised ridge of drift sand in outer mangrove forest (large shrub 3 m. tall, of straggling habit; flowers white; fruit red, 3-angled).

This material suggests *Gymnosporia spinosa* (Blanco) Merr. & Rolfe, but lacks the spines of the latter species.

Kurrimia Archboldiana sp. nov.

Arbor glabra; foliis coriaceis, alternis, 9–18 cm. longis, 4.5–8 cm. latis, ellipticis, apice obtusis vel rotundatis, basi ± rotundatis, margine integerrimis, leviter revolutis, supra lucidis, subtus pallidis; costa media venisque primariis utrinque 9–11, supra subtusque conspicuis; petiolo 1.5–3 cm. longo; racemis axillaribus foliis parum brevioribus; folliculis 2–2.5 cm. longis, circiter 8–9 mm. latis, oblongo-cylindraceis, apice attenuatis, basi angustatis; pedicellis ± 3 mm. longis; semine plerumque 1, interdum 2, ellipsoideo.

British New Guinea: Western Division, Middle Fly River, Lake Daviumbu, *Brass 7754* (type), *7495,* September and August, 1936, common in rain-forest canopy layer (tree 25 m. tall, with hard brown fissured bark; petioles and leaf-nerves white; fruit smooth, yellow, aril orange-colored).

This species strongly suggests *Kurrimia pulcherrima* Wall. ex Lawson; however, the leaves are less tapering at the apex, the primary veins are farther apart (± 1 cm.) and the follicles are shorter and much more abruptly attenuate at the apex. The genus is apparently new to the Papuan flora.

Elaeodendron mindanaense Merr. Philip. Jour. Sci. Bot. **12**: 277. 1917, Enum. Philip. Fl. Pl. **2**: 484. 1923.

BRITISH NEW GUINEA: Western Division, Wassi Kussa River, Tarara, *Brass 8685,* common in underbrush of light rain-forests (tree 6–7 m. high; flowers green); Daru Island, *Brass 6257,* in light rain-forest fringing a mangrove creek (tree 15 m. high; bark pale brown, corky, with a red blaze; flowers small, green; fruit soft, white, compressed, ± 5–6 mm. long, 4–5 mm. in diameter).

These two collections appear to be a very good match for the type-collection of *Elaeodendron mindanaense* Merr., a species previously considered endemic to the Philippines, except that some of the leaves of *Brass 8685* are a little larger. On the other hand, they scarcely seem to differ from our meager material of *E. microcarpum* White & Francis, collected in southeastern Queensland; at present, the latter seems very doubtfully distinct from the former.

Perrottetia grandifolia Ridley, Trans. Linn. Soc. Bot. ser. 2, **9**: 30. 1916.

Perrottetia Schlechteri Loesener, Notizbl. Bot. Gard. Berl. **12**: 37. 1934. *Perrottetia Lauterbachiana* Loesener, op. cit. 36 (incl. forma *β. macrophylla* Loes.).

NORTHEASTERN NEW GUINEA: Yunzaing, *Clemens 2968, 3637;* Ogeramnang, *Clemens 6906;* Kulunghifu, *Clemens 6552.* Described from the Netherlands New Guinea.

In the process of identifying the unnamed Celastraceae from New Guinea, we find ourselves unable to differentiate between Loesener's two species cited in synonymy and Ridley's *Perrottetia grandifolia.* Loesener points out that his *P. Schlechteri* agrees with Ridley's species except for the length of the petiole and the size of the inflorescence. The length of the petiole (1 mm.) as given in Ridley's original description is quite likely a typographical error and the inflorescence (from the description) seems to be very young. The collections from New Guinea differ from our meagre material of *P. moluccana* (Bl.) Loesener in that the leaves of the latter are remotely and minutely crenate-denticulate. The peduncle of the inflorescence is 3.4 cm. long; this is not longer than the maximum length given for *P. Schlechteri* Loes., but it is about twice as long as that in *Schlechter 16808, 17325,* or in any of the specimens we have cited.

HIPPOCRATEACEAE

Salacia subalternifolia sp. nov.

Scandens, glaber; ramulis subteretibus vel compressis, lenticellatis;

foliis alternis vel suboppositis, ± 1 cm. longe petiolatis, coriaceis, ellipticis, apice obtusis vel ± rotundatis, basi rotundatis usque cuneatis, margine subintegris, 9–15 cm. longis, 4.5–8 cm. latis; costa media venisque primariis utrinque 5–6, utrinque prominulis; venis tenuissimis laxe reticulatisque, praecipue subtus prominulis; inflorescentiis axillaribus, cymoso-paniculatis, ± 2 cm. longis; bracteis deltoideis, fimbriatis; pedicellis ultimis 7–10 mm. longis; alabastris ovoideo-globosis, circiter 2 mm. diametro; floribus expansis circiter 7 mm. diametro; sepalis 5, semi-rotundatis, saepe erosis vel ciliolatis; petalis rotundato-ellipticis, 2 mm. longis; staminibus 3 vel 4, supra et intra discum crassum (2 mm. latum) insertis, filamentis vix 0.5 mm. longis latisque, complanatis, apicem versus angustatis; antheris erectis vel recurvis, filamentis paullo angustioribus, apice transverse dehiscentibus; ovario infra discum 3-angulato, stylo brevissimo vel nullo, stigmate parvo; loculis 3 vel interdum 4, 2-ovulatis; fructibus subglobosis, duris, usque 5 cm. diametro (fide Brass); pericarpio subligneo, ± 5 mm. crasso; seminibus 3 (2 × 2.5 × 1.5 cm.), dorso convexis, intra faciebus (2–)3; testa fusca; cotyledonibus molem firmam formantibus.

British New Guinea: Lower Fly River, east bank opposite Sturt Island, *Brass 8066* (type), October, 1936 (large liane climbing to the top of rain-forest trees; flowers green; fruit orange-brown, spherical, up to 5 cm. in diameter).

This species is perhaps an affinity of *Salacia viminea* Lawson, differing in its larger and coriaceous leaves and in its axillary compound cymes; and from most other species in its alternate to subopposite leaves.

RHAMNACEAE

Zizyphus inermis Merr. Govt. Lab. Publ. (Philip.) **35:** 37. 1906, Enum. Philip. Fl. Pl. **2:** 522. 1923.

British New Guinea: Palmer River, 2 miles below Black River Junction, *Brass 7180,* July, 1936, at 100 m. alt., in forests of higher ridges (slender spur-buttressed canopy tree 30 m. high; bark thin, brown; fruit red, fleshy, 1–1.2 cm. in diameter). Solomon Islands: Kugumaru, Buin, *Kajewski 1826,* June 7, 1930, rain-forest (large tree up to 25 m. high; fruit brownish green when ripe, almost globular, 1.3 cm. long, 1.3 cm. in diameter); Marmaromino, *Kajewski 2197,* September 29, 1930, rain-forest, common (small tree up to 10 m. high; fruit narrowed at base, widening at centre and coming to a blunt point, orange-colored when ripe, 1.5 cm. long, 1.2 cm. in diameter at widest base). Previously reported from the Philippines and the Celebes.

With only the brief original description of *Zizyphus Forbesii* Bak. f. (*Forbes,* New Guinea), for comparison, we have been unable to separate the species from the Philippine *Z. inermis* Merr.; hence, for the present we have placed our Papuasian material with the latter species.

Zizyphus oligantha sp. nov.

Frutex scandens; ramulis aculeatis, pubescentibus; foliis inaequilateraliter ovatis, 5–8 cm. longis, 2.5–3.5 cm. latis, acutis vel obtuse acuminatis, basi oblique subrotundatis, supra venis exceptis glabris, subtus fusco-pilosis, chartaceis, crenulato-serrulatis, 3(–5)-nerviis, nervis lateralibus marginem versus ramosis, venulis et nervis subtus prominulis; petiolo 7–8 mm. longo, piloso; stipulis spinescentibus, altera uncinata, altera recta deciduaque; cymis axillaribus, paucifloris, sub maturitate petiolum subaequantibus; floribus pedicellatis, pedicellis 3–4 mm. longis; calycis lobis deltoideis, subacutis, 1.4 mm. longis, extus pilosis, intus carinatis, glabris; petalis cucullatis, glabris, stamina includentibus, calyci subaequilongis; disco ± 5-angulato; ovario glabro; fructibus glabris, obovatis usque subglobosis, ± 7 mm. longis, bilocularibus.

BRITISH NEW GUINEA: Western Division, Mabaduan, *Brass 6488* (type), April, 1936, common in rain-forest undergrowth (large scrambling shrub; flowers small, green; fruit subglobose, black, fleshy, 7–8 mm. in diameter).

The leaves of this species suggest *Zizyphus djamuensis* Lauterb., but the former may be readily distinguished by the much shorter (at anthesis about half as long as the petiole) and fewer-flowered cymes, the sparser pubescence and the glabrous ovary.

Alphitonia ferruginea sp. nov.

Arbor; ramulis tomentosis; foliis alternis, lanceolato-ellipticis, apice acutis, basi rotundatis, vix cordatis, 10–15 cm. longis, 4–6.5 cm. latis, supra glabris, subtus ferrugineo-tomentosis; costa media supra impressa, subtus conspicua; venis primariis utrinque circiter 14–16, conspicuis; petiolo 1–1.5 cm. longo, tomentoso; inflorescentiis cymosis, in ramulis lateralibus foliatis terminalibus axillaribusque; rachi, ramulis, floribus ferrugineo-tomentosis; sepalis 5, triangularibus; petalis 5, cucullatis; disco 5-angulato; ovario tomentuloso; stylo trifido; fructibus glabrescentibus, vix 1 cm. altis; coccis 3.

BRITISH NEW GUINEA: Central Division, Mount Tafa, *Brass 4935* (type), *4082a,* April-September, 1933, at 2400 m. alt., common tree of second growth in the forest.

Alphitonia ferruginea differs from *A. moluccana* Teijs. & Binn. ex Braid in that the ferrugineous tomentum of the leaves and the inflorescence persists; the inflorescence has larger buds (3 mm. in diameter) and flowers (sepals 2 mm. long, open flowers 7 mm. in diameter) than *A. moluccana* (buds about 2 mm. in diameter, open flowers 3–5 mm. broad), and the pubescence of the flower-buds is so thick that the buds appear globular rather than obtusely angled as in the related species.

TILIACEAE

Berrya papuana sp. nov.

Arbor 20 m. alta; ramulis minute stellato-pubescentibus vel sublepidotis; foliis late ellipticis vel subrotundatis, 6–11.5 cm. longis, 4.5–9 cm. latis, apice late obtusis vel subrotundis, basi subcordatis, subintegris, membranaceis vel subcoriaceis, glabris vel subtus in axillis nervorum venarumque barbulatis; nervis basalibus 3, lateralibus reliquis circiter 5–8, subtus venulis sub lente perspicuis; petiolo 2–3 cm. longo, glabro vel sparse sublepidoto; inflorescentiis terminalibus, in fructu usque ad 12 cm. longis, ramosis, stellato-pubescentibus; alabastris oblongo-obovatis; floribus ± 7 mm. longis, roseis; calyce fere ad basim irregulariter fisso (± 3-lobato), dense stellato-puberulo; petalis oblongis, versus basim angustatis; staminibus ± 60, ima basi connatis; filamentis filiformibus, petalis brevioribus; antheris peltatis oblongis, rima longitudinali apicali dehiscentibus; ovario 5-loculari (loculis 3–5-ovulatis), dense stellato-pubescente; stylo glabro; stigmate punctiformi; capsula 1.5 cm. alta, 3 cm. diametro, 5–loculari, scabra; alis 10 fere horizontaliter patentibus, 1.5–1.7 cm. longis, nervosis; carpellis ventre totis connatis; semine uno in quoque loculo, pendulo.

British New Guinea: Central Division, Nakeo District, Baroka, *Brass 3740* (type), April, 1933, at 30 m. alt. in the rain-forest (pyramidal tree, 20 m. tall; trunk corrugated; bark flaky; wood hard, brown; flowers pink; fruit pale green).

This species is manifestly very closely allied to *Berrya javanica* (Turcz.) Burret, but differs in the smaller leaves, the somewhat smaller flowers and the obtuse flower-buds. The seed cavities in the fruit are about half as high as those in the fruit of *B. javanica* (Turcz.) Burret and united to the apex; in the latter species the union of the carpels is very little more than half as high as the seed-cavities.

We have spelled the name of this genus (*Berrya*) according to that found in the list of Nomina Conservanda, rather than the original spelling (*Berria*).

Trichospermum Peekelii Burret, Notizbl. Bot. Gart. Mus. Berl. 9: 853. 1926.

SOLOMON ISLANDS: Bougainville Island, Kugumaru, Buin, *Kajewski 1855*, June 11, 1930, rain-forest, at 150 m. alt., common (large tree up to 20 m. high; fruit 2 cm. long, 2.2 cm. broad, 1 cm. thick. The inner fibre is used for making a strong kind of string and very durable cordages of varying sizes). Type from the Bismarck Archipelago.

By comparison with the original description and a fragment of material determined by Burret, there can be little doubt that this collection represents *Trichospermum Peekelii* Burret; however, it is to be noted that the lower surface of the leaves is densely pubescent in both the flowering and the fruiting material; further, in both the flower-buds and the fruits only two placenta appear. The leaves are approximately 30 cm. long (the apex is broken and ragged in all) and 13 cm. wide. The capsule is bivalvate with a narrow-winged margin and a single locule; the valves are somewhat reniform-retuse, 1.5–2 cm. high, ± 2.2 cm. broad; the seeds are scarcely 1 mm. in diameter, and the surrounding hairs are whitish.

Trichospermum incanum sp. nov.

Arbor usque ad 20 m. alta; ramulis glabris; foliis ellipticis, usque 20 cm. longis, 11.5 cm. latis, basi late rotundatis, apice acutis, margine minute denticulatis, supra in sicco brunneis, subtus canescentibus (dense minuteque stellato-pubescentibus), undique praecipue in costa nervisque sparse hirsutis; nervis basalibus 3, lateralibus supra basin circiter 8; petiolo 1.5 cm. longo, hirsuto; inflorescentiis (in fructu tantum) usque ad 13–15 cm. longis; pedunculo glabrato; ramulis pedicellisque (vix 1.5 cm. longis) stellato-pubescentibus etiam sparse hirsutis; capsulis margine alatis, unilocularibus; valvis 2–2.5 cm. altis, 3.5 cm. latis, atro-brunneis, dense stellato-pubescentibus, pilis minutis et paullo longioribus; seminibus circiter 2 mm. diametro.

SOLOMON ISLANDS: Bougainville Island, Kugumaru, Buin, *Kajewski 1829* (type), June 7, 1930, rain-forest, at 150 m. alt., common.

At the junction of the leaf-blade and the petiole are two obvious glands (± 2 mm. in diameter). The species has leaves about the same size as those of *Trichospermum calyculatum* (Seem.) Burret, but the stipules are deciduous, the sparse hirsuteness of the leaves is persistent and the fruits are much larger.

Trichospermum Kajewskii sp. nov.

Arbor usque ad 20 m. alta; ramulis minute stellato-pubescentibus; foliis ellipticis, 11–15 cm. longis, 6–7 cm. latis, utrinque fere aequaliter

angustatis, margine denticulatis, undique consperse minutissimeque stellato-pubescentibus, concoloribus; nervis basalibus 3, lateralibus supra basim utrinque circiter 6; petiolo 1.5–2 cm. longo, dense stellato-pubescente; inflorescentiis axillaribus, usque ad 8 cm. longis; pedunculis sparse, ramulis pedicellisque dense stellato-pubescentibus; floribus ♀: sepalis 10–11 mm. longis, petalis 9 mm. longis, oblongis, apice retusis, intus basi excepta pilis hirsutis aream glanduligeram cingentibus, ceterum glabris; gynaeceo 5 mm. alto, biloculo, dense stellato-hirsuto; stylo brevi; stigmate bilobo, lobis ± flabellatis, margine irregulariter lobulatis.

Solomon Islands: Guadalcanal Island, Ololo, Tutuve Mountain, *Kajewski 2555* (type), April 22, 1931, rain-forest, at about 1200 m. alt., common (tree small in diameter but with trunk up to 17 m. tall; petals green).

In the size of the leaves and the general habit of the collection this species suggests *Trichospermum Richii* (A. Gray) Seem. but the leaves of the latter are broader at the base and the two glands at the junction of the blade and the petiole are lacking or inconspicuous; in *T. Kajewskii* these glands are conspicuous.

Trichospermum psilocladum sp. nov.

Arbor 10–20 m. alta; ramulis glabris, levibus; foliis ellipticis, 11–20 cm. longis, 5–9.5 cm. latis, apice breviter acuminatis, basi late rotundatis vel leviter cuneatis, margine crenulato-denticulatis, in costa nervisque primariis minutissime stellato-pubescentibus vel sub lepidotis, ceterum glabris; nervis basalibus 3, lateralibus supra basim utrinque circiter 7; petiolo ± 2 cm. longo, fere glabro; inflorescentiis axillaribus, usque ad 10 cm. longis, pedunculis ramulisque glabris, pedicellis 5–7 mm. longis, glabratis vel minutissime stellato-pubescentibus; alabastris stellato-pubescentibus; floribus ♂: sepalis lanceolatis, 1 cm. longis, intus pubescentibus; petalis oblongis, apice ± rotundatis vel retusis, basim versus paullo angustatis, intus basi corona pilorum aream glanduligeram 0.5 mm. altam cingente; androgynophoro 1–1.5 mm. alto, margine hirsutulo; staminibus 5 mm. longis, antheris circiter 1 mm. longis; gynaeceo 2 mm. alto, glabro, basi tantum stellato-pubescente; stylo nullo; stigmate crenate lobato; floribus ♀: sepalis circiter 9 mm. longis; petalis oblongis, apice obtusis, intus basi pilis hirsutis aream glanduligeram cingentibus exceptis glabris; staminibus vix 1 mm. altis, antheris abortivis; gynaeceo vix 4 mm. alto, ovario stellato-pubescente, stylo brevissimo, stigmate bilobo, flabellato; capsulis unilocularibus, bialatis, minutissime stellato-pubescentibus, valvis reniformibus, 1.3 cm. altis, 2 cm. latis; placentis 2 tantum, oppositis.

SOLOMON ISLANDS: Guadalcanal Island, Berande River, *Kajewski 2402* (type, ♀), January 1, 1931, common in rain-forest; Malaita Island, Quoimonapu, *Kajewski 2342* (♂), December 11, 1930, common in rain-forest; San Cristoval Island, Waimamura, *Kajewski 2859*, September 12, 1932, in old garden clearing.

In all these specimens the leaves have two little pouch-like glands at the base of the lamina. The natives use the fibrous inner bark for making string bags, plaiting couches, etc. (fide Kajewski).

Superficially the species closely resembles *Trichospermum Inmac* (Guill.) Burret. Technically it differs in being dioecious, both sterile and fertile flowers having respectively a rudimentary pistil and rudimentary stamens. The style in both *T. Inmac* (Guill.) Burret and *T. psilocladum* is very short, but in the former the stigma is more elongate and incised, whereas, in the latter the two-lobed stigma is almost sessile, each lobe being flattened and crenately orbicular.

Microcos tetrasperma sp. nov.

Arbor 20 m. alta; ramulis teretibus, atrofuscis, glabratis vel sparse minuteque lepidotis; foliis coriaceis, late oblongis ad ellipticis, 15–19 cm. longis, 5.5–7 cm. latis, basi rotundatis, paululo obliquis, apice acutis, margine integris, undique in sicco olivaceo-brunneis, nitidulis, costa media nervisque minute lepidotis, ceterum glabris, nervis basalibus 3 quorum lateralibus paullo supra basim laminae orientibus, alte ascendentibus et $^2/_3$–$^3/_4$ laminae aequantibus; nervis lateralibus reliquis 3–4 in quoque latere, quorum infimo fere in media lamina oriente; venulis utrinque valde reticulatis; petiolo 2 cm. longo, a medio superne paullo incrassato, glabro ad minute lepidoto; stipulis linearibus, caducis; inflorescentiis terminalibus axillaribusque, paniculatis (?), in fructu ± 7 cm. longis; fructibus obovoideis, 2.5 cm. longis, 2.2 cm. diametro, 4-locularibus, epicarpio membranaceo, glabro, levi, mesocarpio fibris tenuibus densis percurso, endocarpio osseo, circiter 1 mm. crasso; semine uno in quoque loculo.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass 7047* (type), June, 1936, at 100 m. alt., common in ridge-forests (tree 20 m. tall; trunk flanged at the base; bark gray, lenticellate; wood yellow, coarse-grained; leaves stiff, nerves prominent especially on the lower surface; fruit obovoid, orange-yellow, ± 3 cm. long, 2.5 cm. in diameter).

The descriptions of *Microcos Schlechteri* Burret and *M. Ledermannii* Burret indicate that this is a very closely related species; it differs in having coriaceous leaves with a definitely rounded base; both the upper

and the lower surfaces dry the same color, brownish with the main nerves appearing dark reddish brown; the stipules are linear and have not yet fallen from the upper part of the vegetative shoot.

Microcos grandiflora Burret, Notizbl. Bot. Gart. Mus. Berl. **9**: 784. 1926.

British New Guinea: Fly River, 528 Mile Camp, *Brass 6658,* May, 1936, at 80 m. alt., common in the forest canopy (large tree with spur-buttressed stem and close brown bark; fruit ovate, pubescent, orange-colored, ± 5.5 cm. long, 4.5 cm. in diameter). Known only from New Guinea.

Lacking material for comparison, we have accepted *Brass 6658* (a collection in fruit only) as a reasonably good match for *Microcos grandiflora* Burret, at least as to the description of the leaves. In our specimen the largest leaves are up to 12 cm. broad, 28 cm. long, and the acumen 4 cm. long (5 mm. broad at the base and 0.5 mm. at the apex), in the type the acumen is only 2.5 cm. long. The ellipsoid or slightly obovoid fruit consists of a thin pubescent epicarp (most of the pubescence has been rubbed off), a mesocarp (1.5 cm. thick at the middle of the fruit) of very tough slender fibres, and a bony endocarp covering two locules.

Colona scabra (Sm.) Burret, Notizbl. Bot. Gart. Mus. Berl. **9**: 800. 1926.

Microcos scabra Sm. in Rees Cycl. **23**: n. 3. 1812–1813.
Columbia integrifolia Warb. Bot. Jahrb. **13**: 372. 1891.
Columbia subobovata Hochr. Pl. Bogor. Exsicc. 25, n. 46. 1904; Merr. Interpret. Rumph. Herb. Amboin. 354. 1917.

Solomon Islands: Guadalcanal Island, Berande, *Kajewski 2437,* January 10, 1931, rain-forest, common (medium tree, up to 20 m. high; buds covered with short silky hair, sepals greenish yellow, petals yellow spotted with maroon); Ysabel Island, Garona, *Brass 3356,* lowland rain-forests (tree with pale, fissured bark; corolla very dark mottled brown).

The species is definitely reported from Celebes, Amboina, Aru, and Palau. For a full discussion of the synonymy cf. Burret, l. c.

Colona discolor sp. nov.

Arbor ± 10 m. alta; ramulis atrofuscis, stellato-pubescentibus ad glabratis; foliis coriaceis, oblongis, 15–19 cm. longis, 3.5–6.5 cm. latis, apice acutis ad acuminatis, basi rotundatis vel subcordatis, leviter obliquis, margine minute serratis, supra brunnescentibus, consperse minuteque stellato-pubescentibus; subtus fusco-velutinis; nervis basalibus

3, quorum 2 lateralibus dimidiam laminam aequantibus; lateralibus supra basim 6–7, ascendentibus; petiolo 7–10 mm. longo, dense pubescente; inflorescentiis terminalibus, paniculatis, in fructu 22 cm. longis, 15 cm. latis, flavido-tomentosis; capsulis indehiscentibus (?), 1.5 cm. longis latisque, 3-alatis vel 4-alatis, apice retusis ad emarginatis, corpore modice tumido.

BRITISH NEW GUINEA: Western Division, Mabaduan, *Brass 6532* (type), April, 1936, abundant in riverine rain-forest and on grass areas deforested for gardening.

The species is somewhat similar to **Colona aequilateralis** (White & Francis) comb. nov. (*Columbia aequilateralis* White & Francis, Proc. Roy. Soc. Queensl. **38:** 240, *f.* 7. 1927) and *C. Archboldiana*. From both *C. discolor* differs in the retuse to emarginate apex of the fruits. These are smaller than those of the first mentioned species and the wings also are much narrower.

Colona velutina sp. nov.

Arbor ad 18 m. alta; ramulis ut inflorescentiis pallide flavido-hirsutis; foliis oblongis, ± 23 cm. longis, 8 cm. latis, apice obtusiuscule acuminatis, basi valde obliquis, subauriculatis, margine integris, supra brunneis (in sicco), costa media nervisque primariis hirsutulis, ceterum demum glabris; subtus flavo-viridibus vel brunnescentibus, velutinis; nervis basalibus 5–7, quorum 2 lateralibus dimidiam laminam aequantibus; lateralibus reliquis in quoque latere 6–7, curvatim ascendentibus; petiolo 1.5 cm. longo, dense hirsuto; inflorescentiis terminalibus, ramosis; alabastris globosis, ± 4 mm. diametro; sepalis oblongis, 7 mm. longis, obtusis, extus tomentosis, intus pubescentibus; petalis ± 5 mm. longis, oblanceolatis, apice rotundatis, extus sparse pilosulis, intus ad basim aream glanduligeram 0.5 mm. longam, lateraliter ut superne, ubi area glabra ± 0.5 mm. alta, corona pilorum circumcinctam gerentibus; androgynophoro longitudine aream glanduligeram aequante; staminibus ± 3.5 mm. longis; gynaeceo tomentoso, 3–5-loculari, stylo glabro; fructibus ± 2.2 cm. longis atque diametientibus, alatis (alis ± 5 mm. latis), omnino tomentosis.

SOLOMON ISLANDS: Guadalcanal Island, Konga, Ma-massa, *Kajewski 2465* (type), February 8, 1931, rain-forest, at 500 m. alt., common (medium tree with straight trunk up to 18 m. high; all small stems, the lower surface of the leaves and the buds covered with fine hair; fruit leathery, quadrangular. The bast is used in making small baskets for carrying tobacco, betel nut, etc.).

As far as we can judge from the specimen, the fruit is indehiscent;

hence, the species belongs to the section HOLOCARPUS. It strongly suggests *Colona megacarpa* (Merr.) Burret in leaf-size and the pubescence of the fruit, but the hairs are more evenly distributed in *C. velutina*, the fruit is 3–4-winged, the leaves are gradually but not long acuminate, and the leaf-margin is entire.

Colona Archboldiana sp. nov.

Arbor 7–8 m. alta; ramulis fuscis, stellato-pubescentibus ad glabratis; foliis chartaceis, oblongis, 18–27 cm. longis, 7–9 cm. latis, apice breviter acuminatis vel longe acutis, basi subaequaliter rotundatis, margine minute serrulatis vel nervis minute projectis, supra brunnescentibus, dense in nervis sparse in facie pilis stellatis minutis praeditis, subtus velutino-canescentibus; nervis basalibus 3, quorum 2 lateralibus dimidiam laminam altitudine fere aequantibus, lateralibus ceteris supra basim utrinque 6–8 arcte ascendentibus; petiolo 1.3 cm. longo, a medio superne manifeste incrassato, dense stellato-pubescente; inflorescentiis terminalibus, paniculatis, (in specimine) circiter 20 cm. longis; floribus pedicellatis; sepalis circiter 7 mm. longis, ± 2.5 mm. latis, oblongis, acutis, extus stellato-tomentosis, intus breviter pilosis; petalis 5 mm. longis, oblanceolatis, dorso sparse pilosulis, area glanduligera 0.5 mm. alta corona pilorum circumcincta; androgynophoro longitudine aream glanduliferam aequante; staminibus ± 3 mm. altis; gynaeceo albido-tomentoso, 3-angulari, 3-loculari, stylo basi pubescente, superne glabro; fructibus pubescentibus interdum pilis longis interspersis, fere isodiametricis, 1–1.5 cm. longis latisque, apice obtusis vel rotundatis, alis angustatis, corpore tumido.

BRITISH NEW GUINEA: Western Division, Upper Wassi Kussa River (left branch), *Brass 8631* (type), January, 1937, common about grassy margins of rain-forest (thinly foliaged tree of weak branching habit, 7–8 m. high; leaves gray beneath).

The fruit is very tardily, if at all, dehiscent, hence, the species seems to belong to the section HOLOCARPUS. Its most obvious characters are the rounded scarcely oblique base of the leaves, the gray indumentum of the lower surface, and the minutely serrate margin (apparently formed by the very slight projection of the lateral veins); the fruit is obtusish at the apex and the wings are much narrower than in other species which we have examined.

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RECORDS OF INDO-CHINESE PLANTS

E. D. MERRILL

THE FOLLOWING PAPER is based on selected specimens received from time to time from Dr. A. Pételot of the Université Indochinoise at Hanoi. Several previously described species are herein first credited to Indo-China, while seven are described as new. The genera *Torricellia* de Candolle and *Bennettiodendron* Merrill (*Bennettia* Miquel) are new to Indo-China, while the first true representative of the genus *Sarcosperma* Hooker f. for Indo-China is herein recorded.

HIPPOCASTANEACEAE

Aesculus assamica Griff. Notul. **4**: 540. 1854; Kurz, For. Fl. Brit. Burma **1**: 286. 1877; Craib, Fl. Siam. Enum. **1**: 338. 1926.

Aesculus punduana Wall. List, no. 1189. 1829, *nomen nudum;* Hiern, in Hook. f. Fl. Brit. Ind. **1**: 675. 1875.

Aesculus khasyana Voigt, Hort. Suburb. Calc. 97. 1845, *nomen nudum.*

INDO-CHINA, Tonkin, Langson Province, near Dong Mo, *Pételot 6315,* February, 1938. Sikkim, Assam, Burma, Siam, and Yunnan.

Not previously recorded from Indo-China, the only species of the genus admitted by Lecomte, Fl. Gén. Indo-Chine **1**: 1005. 1912, being *Aesculus chinensis* Bunge. As the latter species is one of northern China (Chihli, Shansi, Shensi, Honan, Chekiang, Kiangsu) it is suspected that Lecomte's Indo-Chinese record was based on an erroneously identified specimen. Possibly a glabrescent form of *Aesculus Wilsonii* Rehd. is represented by the Balansa specimen that Lecomte examined.

SABIACEAE

Meliosma caudata sp. nov. § *Simplices.*

Species *M. squamulatae* Hance affinis, differt foliis glabris, haud lepidotulis, nervis lateralibus magis numerosis, floribus pedicellatis, in ramulis ultimis racemose haud glomeratim dispositis. Frutex vel arbor parva, ramis teretibus, glabris, plus minusve lenticellatis, ultimis circiter 2 mm. diametro; foliis simplicibus, firme chartaceis vel subcoriaceis, oblongo-oblanceolatis, longe caudato-acuminatis, acuminibus gracilibus, obtusis, 1.5–2.5 cm. longis, basi acutis, margine integris vel in partibus superioribus dentes conspicuos 1 vel 2 utrinque gerentibus, 7–12 cm. longis, 2–3.5

cm. latis, utrinque glabris, supra olivaceis, opacis, subtus pallide brunneis; nervis primariis utrinque 9–12, curvato-adscendentibus, arcuato-anastomosantibus, supra subobscuris, subtus elevatis, perspicuis, reticulis primariis distinctis, sublaxis; petiolo gracili, 2.5–5 cm. longo; inflorescentiis terminalibus vel in axillis superioribus, paniculatis, pedunculatis, folia aequantibus vel paullo excedentibus, adpresse pubescentibus, pedunculo 4–7 cm. longo; ramis primariis 2–4 cm. longis; floribus numerosis, racemose dispositis, haud glomeratis, omnibus pedicellatis, pedicellis dense adpresse pubescentibus, 1–3 mm. longis; bracteolis late ovatis, pubescentibus, circiter 1 mm. longis; sepalis late rotundato-ovatis, obtusis, 1.5 mm. longis; petalis majoribus orbiculari-ovatis, concavis, 2.5 mm. longis; ovario ovoideo, glabro, stylis ovarium aequantibus.

INDO-CHINA, Tonkin, near Chapa, *A. Pételot 6342*, April, 1938, altitude about 1600 m.

While I have compared this with *Meliosma squamulata* Hance, from which it differs notably in its rather open panicles, the racemosely arranged flowers being distinctly pedicelled, not in glomerules, as well as in its different vegetative characters, its true alliance may be with three very closely allied species of India and southwestern China, *M. pungens* Wall., *M. yunnanensis* Franch., and *M. Fischeriana* Rehd. & Wils. from all of which it differs by its very slender, greatly elongated petioles. Normally there are from three to five erect panicles from the tips or from near the tips of each ultimate branchlet. The leaves may be entire, or with one or two conspicuous sharp teeth on each side in the upper one-half.

THEACEAE

Camellia indochinensis sp. nov. § *Theopsis*.

Arbor parva, glaberrima, ramis ramulisque teretibus, ramulis ultimis circiter 1 mm. diametro, internodiis plerumque 1–2.5 cm. longis; foliis chartaceis, ellipticis, 5–11 cm. longis, 2–5 cm. latis, laevibus, supra viridibus vel viridi-olivaceis, subtus pallidioribus, breviter obtuse acuminatis, basi acutis vel leviter acuminatis, margine breviter serrato-dentatis vel serrato-crenulatis, dentibus brevissimis, plerumque brevissime apiculato-glandulosis, 2–3 mm. distantibus; nervis primariis utrinque 6–7, subtus elevatis, distincte laxe arcuato-anastomosantibus, reticulis primariis laxis; petiolo circiter 5 mm. longo; floribus axillaribus terminalibusque, solitariis, albidis, breviter (ca. 1 mm.) pedicellatis, 1.5–2 cm. diametro; bracteolis glabris, circiter 1.5 mm. longis; sepalis utrinque glabris, concavis, coriaceis, exterioribus subovatis, circiter 3 mm. longis, interioribus ellipticis, tenuioribus, ad 8 mm. longis; petalis membranaceis, ellip-

ticis, rotundatis, glabris, circiter 1.5 cm. longis, deorsum connatis; staminibus numerosis, circiter 1 cm. longis, filamentis glabris, deorsum connatis, basi petalis adnatis; ovario glabro; stylis 3, gracilibus, ad basim liberis, circiter 1.2 cm. longis.

INDO-CHINA, Tonkin, Langson Province, near Van Linh, *Pételot 6459*, November 17, 1938, on calcareous rocks or ledges.

A species characterized by being entirely glabrous in all parts, by its relatively thin leaves, and especially by its three, slender, entirely free styles. It is perhaps most closely allied to *Camellia rosaeflora* Hook. of China.

Camellia cordatula sp. nov.

Frutex vel arbor parva, glabra, ramis ramulisque teretibus, ramulis laevibus, ultimis 1.5–2 mm. diametro, internodiis 2–8 cm. longis; foliis brevissime petiolatis, firme chartaceis vel subcoriaceis, late oblongis vel oblongo-ellipticis, 10–15 cm. longis, 4–7 cm. latis, supra olivaceis, subnitidis, subtus paullo pallidioribus, utrinque minutissime verruculosis, basi rotundatis, distincte cordatis, semiamplexicaulibus, apice distincte obtuseque acuminatis, margine minute subdistanter subcrenato-denticulatis, dentibus 2–6 mm. distantibus; nervis primariis utrinque 8–10, subtus elevatis, curvatis, arcuato-anastomosantibus, reticulis obsoletis vel subobsoletis; petiolo 2–3 mm. longo; floribus axillaribus vel terminalibus, solitariis, saltem 3 cm. diametro, breviter (3–4 mm.) pedicellatis; sepalis numerosis, extus minute puberulis, intus glabris, subcoriaceis, omnibus rotundatis, exterioribus reniformibus, 3–4 mm. longis, 6–7 mm. latis, interioribus gradatim majoribus, ultimis subellipticis, 2–2.5 cm. longis, circiter 1.5 cm. latis; petalis staminibusque ignotis; ovario ovoideo, dense pubescente, stylis 5, ad basim liberis, cinereo-pubescentibus, circiter 1.5 cm. longis; bracteolis late ovatis, subimbricatis, 2–3 mm. longis, rotundatis, interdum breviter apiculatis.

INDO-CHINA, Tonkin, Hoa Binh Province, between Hoa Binh and Vu Ban, *A. Pételot 6387*, May 5, 1938.

A species apparently belonging in the group with *Thea flava* Pitard, characterized by its shortly petioled, distinctly cordate and semiamplexicaul leaves and its five free styles, the styles and ovary densely pubescent.

CORNACEAE

Torricellia angulata Oliver var. **intermedia** (Harms) Hu, Jour. Arnold Arb. **13**: 336. 1932, Ic. Pl. Sin. **5**: 37. *t. 237*. 1937.

Torricellia intermedia Harms ex Diels, Bot. Jahrb. **29**: 507. 1901, Wang. Pflanzenr. **41(IV.129)**: 33. 1910.

INDO-CHINA, Tonkin, Chapa, *Pételot 6363,* April, 1938, alt. 1500 m. Yunnan, Szechuan, Hunan, Kwangsi, the species in Szechuan and Hupeh.

This is the first representative of the genus to be reported from Indo-China, although Gagnepain, suspecting that it might occur there, included it in his key to the genera (Lecomte, Fl. Gén. Indo-Chine **2:** 1184. 1923). This Tonkin form seems clearly to be the same as *T. intermedia* Harms, which Hu, with apparently valid reasons, has placed as a variety of *T. angulata* Oliver. When Wangerin monographed the group in 1910, he had seen no specimens representing Oliver's species, recognizing three species, *T. tiliaefolia* DC., *T. angulata* Oliver, and *T. intermedia* Harms.

MYRSINACEAE

Maesa acuminatissima Merr. Philip. Jour. Sci. **23:** 257. 1923.

Maesa striata Mez, var. *opaca* Pitard in Lecomte, Fl. Gén. Indo-Chine **3:** 784. *f. 88, 4.* 1930.

Whether this be considered merely as a variety of *Maesa striata* Mez (type from Sumatra), or as a distinct species, *M. striata* Mez var. *opaca* Pitard is clearly the same as the earlier *M. acuminatissima* Merr. (type from Hainan). Pitard gave a very ample description of his variety, based on collections from several localities in Tonkin, including Mount Bavi. It is now represented by several Hainan collections, and I have examined one recent one from Mount Bavi, *Pételot 6311,* Feb. 24, 1938. Indo-China, Hainan, and Kwangsi (*Tsang 24715*).

PRIMULACEAE

Primula cordata sp. nov. § *Carolinella.*

Planta astolonifera, foliis omnibus basalibus, elliptico-ovatis vel late ovatis, chartaceis, late rotundatis, basi distincte cordatis, auriculis latissime rotundatis, haud lobatis, margine leviter denticulatis crenato-denticulatis vel integris, in sicco leviter rugosis, supra olivaceis, glabris, subtus pallidioribus, secus costam nervosque obscure pubescentibus, 4.5–6 cm. longis, 3.5–5.5 cm. latis, nervis primariis utrinque circiter 5, subtus elevatis, arcuato-anastomosantibus, reticulis supra subelevatis, distinctis, subtus gracilioribus; petiolo gracili, 2–5 cm. longo, sulcato, haud alato, consperse obscure pubescente; scapo gracili, sulcato, leviter consperse pubescente, circiter 10 cm. longo; bracteis anguste lanceolatis, acuminatis, 2–4.5 mm. longis, obscure pubescentibus; floribus 6–8, umbellato-racemosis, parvis, pedicellis 5–7 mm. longis; calycis tubo circiter 1.6 mm. longo, lobis lanceolatis, acuminatis, 1 mm. longis, haud

accrescentibus; corollae tubo 7 mm. longo, cylindrico, sursum leviter ampliato, lobis patulis, obcordatis, 3.5–4 mm. longis; filamentis brevissimis, antheris 1–1.2 mm. longis; ovario glabro; stylis 7 mm. longis; capsulis ignotis.

INDO-CHINA, Tonkin, Chapa, *A. Pételot 6448,* April, 1938, on clayey, humid, talus slopes, route to Lo Qui Ho, alt. 1800 m.

Primula cordata Merr. seems clearly to be allied to *P. Partschiana* Pax (*Carolinella cordifolia* Hemsl.) which was based on *Henry 10890* from Yunnan, but has very much smaller leaves which are not at all setaceous-dentate, shorter petioles and almost umbellate, rather than racemose inflorescences (the pedicels so crowded that the inflorescence looks almost like a true umbel), while the flowers are distinctly smaller than are those of Pax's species. The vegetative characters of the present species render it necessary to recast Pax and Knuth's key, as by the characters given by them *Primula cordata* Merr. falls in the section BULLATAE Pax where it manifestly does not belong.

This is the third species of *Primula* to be recorded from Indo-China, Gagnepain, in 1930, recognizing only *P. chapaensis* Gagnep. The second species is *Primula Petelotii* W. W. Sm. Notes Bot. Gard. Edinb. **16**: 288. 1931, based on *Pételot 3717* from Chapa; all three known species occur in one general locality.

Lysimachia chapaensis sp. nov. § *Eulysimachia, Apodanthera* (*Alternifoliae*).

Herba glaberrima, epunctata, haud aromatica, simplex vel pauciramosa, caulibus deorsum prostratis, radicantibus, 15–60 cm. longis, sursum erectis, 2–2.5 mm. diametro, sulcatis vel subteretibus, haud alatis; foliis omnibus alternis, membranaceis, olivaceo-viridibus, haud punctatis, oblongo-ovatis vel ovato-ellipticis, perspicue acuminatis, basi acutis, nervis primariis utrinque 4–5, gracilibus, subadscendentibus; petiolo gracili, haud alato, 1–2.5 cm. longo; inflorescentiis terminalibus vel subterminalibus, depauperato-racemosis, pauciforis, rhachibus 1–1.5 cm. longis, flores 2–3 longe pedicellatos gerentibus, pedicellis gracilibus, 4–5 cm. longis, bracteolis lanceolatis, acuminatis, 3–4.5 mm. longis; floribus ut videtur flavidis, plerumque 5-meris, circiter 3 cm. diametro; sepalis 5 (raro 6 vel 7), oblongo-ovatis vel ovato-lanceolatis, acuminatis, graciliter 5-nervis, haud punctatis, circiter 4 mm. longis, 1.5–2 mm. latis, deorsum leviter connatis; petalis 5, oblongo-ellipticis, rotundatis, circiter 1.4 cm. longis, 6 mm. latis, subliberis; staminibus 5, filamentis crassissimis, vix 2 mm. longis, deorsum leviter connatis, quam antheris multo brevioribus; antheris oblongis, obtusis, 3.5–5 mm. longis, basi sagittatis,

lateraliter dehiscentibus; ovario ovoideo, glabro; stylis 6 mm. longis.

INDO-CHINA, Tonkin, Chapa, *A. Pételot 6347,* April, 1938, altitude about 1800 m.

This species has been placed in accordance with Handel-Mazzetti's revision of the Chinese species, Notes Bot. Gard. Edinb. **16:** 51–122. 1928, and is the fifteenth species of the genus to be reported from Indo-China. Its general alliance is with *Lysimachia ramosa* Wall. It is well characterized by its usually elongated terete or subterete stems which are prostrate and often rooting below, and its usually 3-flowered, terminal or subterminal racemes, each pedicel being subtended by a small leaf-like bracteole. Like Wallich's species the anthers open by lateral slits, not by terminal pores as do many of the other species in this group. In one flower dissected seven sepals were found, but this flower was otherwise 5-merous.

SARCOSPERMATACEAE

Sarcosperma kachinense (King & Pantl.) Exell, Jour. Bot. **69:** 100. 1931; Lam. & Varos. Blumea **3:** 188. 1938, *cum syn.*

INDO-CHINA, Tonkin, Langson Province, Thanh Moi, *Pételot 6281,* February, 1938. Burma, Siam, southeastern Tibet, Yunnan, Kwangsi, Kwangtung, and Hainan.

This is apparently the first true *Sarcosperma* to be recorded from Indo-China, as *S. tonkinense* H. Lecomte, Bull. Mus. Hist. Nat. Paris **24:** 534. 1918, Fl. Gén. Indo-Chine **3:** 914. 1930, is excluded from the genus by Lam and Varossieau in their recent monographic treatment of the group, Blumea **3:** 198. 1938. They conclude that *Sarcosperma tonkinense* H. Lecomte probably does not belong in the Sarcospermataceae. The species was originally described as *Combretum kachinense* King & Pantling in 1900, and again, independently, as *Sarcosperma kachinense* Cowan in October, 1931, who overlooked Exell's transfer of *Combretum kachinense* King & Pantl. to *Sarcosperma* in April, 1931.

OLEACEAE

Linociera brachythyrsa sp. nov.

Arbor parva, 5–6 m. alta, glabra, inflorescentiis leviter pubescentibus exceptis; ramis ramulisque pallidis, teretibus, ultimis circiter 1 mm. diametro; foliis oppositis, ellipticis, firme chartaceis vel subcoriaceis, in sicco pallidis, opacis vel leviter nitidis, subabrupte obtuse acuminatis, basi acutis vel subobtusis, 6–9 cm. longis, 2–4 cm. latis, nervis primariis utrinque 6–9, patulis, supra obscuris, subtus elevatis, perspicuis, arcuato-

anastomosantibus, reticulis laxis, haud perspicuis; petiolo 1–2 mm. longo; inflorescentiis axillaribus terminalibusque, 1–2 cm. longis, distincte pedunculatis vel e basi ramosis, leviter pubescentibus; bracteis bracteolisque 2–2.5 mm. longis, subspathaceis vel obovatis, extus leviter pubescentibus; floribus perfectis, circiter 7 mm. longis, subconfertis, breviter (1.5–2 mm.) pedicellatis; sepalis ovatis, acutis vel obtusis, leviter pubescentibus, circiter 1.5 mm. longis; petalis liberis, anguste oblongis, circiter 7 mm. longis et 1 mm. latis, sursum vix angustatis, obtusis, haud acuminatis; antheris ellipsoideis, 1 mm. longis; ovario ovoideo, glabro.

INDO-CHINA, Tonkin, Langson Province, near Van Linh, *A. Pételot 6293*, February, 1938, near small streams, flowers reddish.

A species well characterized by its pale, prominently nerved, relatively small leaves and especially by its flowers being somewhat crowded in unusually short inflorescences, as well as by the sparse indumentum on the inflorescences. By Gagnepain's arrangement of the nine hitherto known species of Indo-China, it falls in the group with *L. macrophylla* Wall. and *L. Harmandii* Gagnep., but is not closely allied to either of these.

FLACOURTIACEAE

Bennettiodendron cordatum sp. nov.

Arbor parva, 5–6 m. alta, ramis teretibus, laevibus, glabris, ramulis circiter 1.5 mm. diametro, dense pubescentibus; foliis firme chartaceis, oblongo-ellipticis, 8–16 cm. longis, 4–7 cm. latis, distincte acuminatis, deorsum paullo angustatis, subabrupte rotundatis, distincte cordatis, margine serratis, dentibus subobtusis, 4–9 mm. distantibus, supra olivaceis, praeter costam nervosque leviter pubescentia glabris, subtus subconcoloribus, ad costam nervosque distincte pubescentibus, reticulis primariis laxis elevatis puberulis; nervis lateralibus utrinque circiter 10, subtus elevatis, valde perspicuis, arcuato-anastomosantibus; petiolo 8–18 mm. longo, dense pubescente; inflorescentiis racemoso-paniculatis plerumque terminalibus, solitariis, puberulis, 5–7 cm. longis, ramis primariis brevibus, 1–3 mm. longis, plerumque 2–3-floris; pedicellis puberulis, 2–3 mm. longis; floribus ♂ 3-meris, sepalis suborbiculari-ovatis, rotundatis, concavis, submembranaceis, 3–3.5 mm. longis, tenuiter 3–4-venosis, extus glabris, margine plus minusve ciliatis; staminibus numerosis, filamentis 3 mm. longis, pilosis; glandulis anguste ovoideis, glabris, 0.5 mm. longis.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *A. Pételot 6308*, February 24, 1938, in open forests, altitude about 400 m.

A species, in this small group, whether considered under *Bennettiodendron* Merrill (1927), or as *Bennettia* Miquel (1859), (non *Bennettia* S. F. Gray 1821, nec R. Brown, 1852), strongly characterized by its distinctly cordate leaves and by its indumentum. The first representative of the genus to be recorded from Indo-China.

SYMPLOCACEAE

Symplocos congesta Benth. Fl. Hongk. 211. 1861; Brand, Pflanzenr. **6(IV.242):** 69. 1901.

INDO-CHINA, Tonkin, Chapa, *Pételot 6369*, April, 1938, altitude about 1500 m. Hongkong, Kwangtung, Kwangsi, Kiangsi.

Bentham's species was based on a Hongkong specimen collected by Champion, with the citation of a *Fortune* specimen. He describes the leaves as "entire or rarely bordered with small glandular teeth" and Brand merely says "folia . . . denticulata." The Champion specimen in the Kew herbarium has entire leaves, but I have not seen the Fortune material; all our Kwangtung, Kwangsi, and Kiangsi material has entire leaves. It is suspected that *Symplocos cuspidata* Brand, Pflanzenr. **6(IV.242):** 69. 1901, which was based on a North River specimen from Kwangtung, will not prove to be distinct.

VERBENACEAE

Premna Chevalieri Dop. Bull. Soc. Bot. France **70:** 445. 1923, et in Lecomte Fl. Gén. Indo-Chine **4:** 813. *f. 87, 6.* 1935.

Premna acuminatissima Merr. Univ. Calif. Publ. Bot. **10:** 430. 1924, non Merr. Lingnan Sci. Jour. **6:** 884. 1930.

Dr. Dop's species was based on Tonkin collections made by Chevalier and by Bon, while mine, published a year later, was based on *Pételot 1434;* the two are manifestly identical. The true alliance of this species is with the Chinese *Premna puberula* Pamp., and some forms very closely approximate the latter.

In 1930 I inadvertently published a second species, from Hainan, under the same binomial I had used for the Indo-Chinese species six years earlier, and in his synonymy Dr. Dop (Fl. Gén. Indo-Chine) has confused this with the earlier one. His citations to the Lingnan Science Journal and P'ei's treatment of the Chinese Verbenaceae should be eliminated and the one to the University of California publication added. The Hainan species is very different from the Indo-Chinese one, and the following nomenclatural adjustment is made for it:

Premna octonervia Merrill & Metcalf nom. nov.

Premna acuminatissima Merr. Lingnan Sci. Jour. **6**: 884. 1930; P'ei, Mem. Sci. Soc. China **1**(3): 73. *t. 15.* 1932 (Verb. China), non Merr. Univ. Calif. Publ. Bot. **10**: 430. 1924.

This species with corymbose inflorescences rather than paniculate ones, is not closely related to *Premna Chevalieri* Dop, and at present is known only from Hainan. It is represented by the following specimens: *Lau 362, 1579, 1655, 5143, 6234, 26732, 26843, How 70841, Fung 20387, Tsang 15660,* and *Wang 34111, 35000.*

Premna fulva Craib, Kew Bull. **1911**: 442. 1911; Dop in Lecomte Fl. Gén. Indo-Chine **4**: 809. 1935.

Premna crassa Hand.-Maz. Anz. Akad. Wiss. Wien **58**: 231. 1921; Symb. Sin. **7**: 904, 1936; P'ei, Mem. Sci. Soc. China **1**(3): 76. 1932 (Verb. China).

Premna Fortunati Dop, Bull. Soc. Bot. France **70**: 444. 1923.

INDO-CHINA, Tonkin, Langson Province, between Dang Mo and Van Linh, *Pételot 6374,* April 3, 1938; Ninh Binh Province, Cho Ganh, *Pételot 890,* April, 1923. Siam, Yunnan, Kweichow, Kwangsi.

Pételot's specimens are in flower, while the type collection of *Premna crassa* Hand.-Maz., is in fruit, yet as far as the material is directly comparable I can detect no tangible differences. Handel-Mazzetti has suggested the reduction of *Premna Fortunati* Dop to *P. crassa* Hand.-Maz., and from the published descriptions, a fragment of Dop's type, and an isotype of *Premna crassa* Hand.-Maz., I can see no reasons for distinguishing the two. At my request Mlle. Ast compared the material in the Paris Herbarium with the available specimens representing *Premna fulva* Craib, and states that, in view of the intermediate characters of some of the specimens, in her opinion the two should be united without even a varietal distinction. *S. P. Ko 55136* from Tai Chin Shan, Kwangsi, represents the same species.

SCROPHULARIACEAE

Paulownia Fortunei (Champ.) Hemsl. Jour. Linn. Soc. Bot. **26**: 180. 1890.

Campsis Fortunei Seem. Jour. Bot. **5**: 373. 1867.
Paulownia Mikado T. Ito, Ic. Pl. Jap. **1**: *t. 9–12.* 1912.

INDO-CHINA, Tonkin, Chapa, *Pételot 4182,* February, 1931, altitude 1500 m., a tree 8–10 m. high, corolla violaceous, the flowers appearing before the leaves; Langson Province, between Dong Mo and Van Linh, *Pételot 6323,* March 24, 1936, in open forests. Chekiang, Anhwei,

Fukien, Kwangtung, Kweichow, Kwangsi, Honan, Yunnan, and Formosa.

Paulownia meridionalis Dode was described from imperfect specimens (flowers unknown but said to be white) from Laos, while I have previously credited *P. Fargesii* Franch. to Tonkin. The specimens above cited, with numerous mature flowers, seem to represent typical *Paulownia Fortunei* (Seem.) Hemsl. from which *P. Mikado* T. Ito does not appear to be distinct.

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ON CERTAIN MALAYSIAN SPECIES OF MELIOSMA BLUME[1]

E. D. MERRILL AND L. M. PERRY

IN STUDYING the assembled Meliosma material (excluding the Chinese collections) in the herbarium of the Arnold Arboretum we note some significant extensions of range, and include also the description of three hitherto apparently undescribed species. These data are embodied in the present paper.

Meliosma Bartlettii nom. nov.

Meliosma trichocarpa Merr. Pap. Michigan Acad. Sci. **24**(1): 80. 1938 (1939), non Handel-Mazzetti, 1934.

A new name is needed for this Sumatran species, which was based on a series of specimens secured by Professor H. H. Bartlett's native collector Rahmat. Handel-Mazzetti used the name for a Chinese species in 1934; hence, this necessary change.

Meliosma pedicellata Koord. & Val. Meded. Lands Plant. **61**: 134. 1903 (Bijdr. Boomsoort. Java **9**: 134), Atlas Baumart. Java **2**: *f. 379*. 1914.

BRITISH NORTH BORNEO: Mount Kinabalu, Upper Kinataki River, *Clemens 31993,* February 22, 1933, at about 2100 m. alt.; Penataran River, *Clemens 33631,* June 21, 1933, at about 2700 m. alt.; Colombon River, *Clemens 33710,* June 27, 1933, at about 1700 m. alt.

These collections differ from the original description and plate of *Meliosma pedicellata* Koord. & Val. only in the somewhat larger leaves (9–18 cm. long, 3.5–8 cm. broad).

Meliosma ferruginea Blume, Cat. Gew. Buitenz. 32. 1823; Nees, Bot. Zeit. **8**(1): 106. 1825; Blume, Rumphia **3**: 200. 1847; Miq. Fl. Ind. Bat. **1**(2): 616. 1859, Fl. Arch. Ind. 74. 1871; Koord. & Val. Meded. Lands Plant. **61**: 121. 1903 (Bijdr. Boomsoort. Java **9**: 121), Atlas Baumart. Java **2**: *f. 375*. 1914.

Millingtonia ferruginea Schult. Syst. Veg. Mant. **1**, Add. **2**: 250. 1827.

NORTHEASTERN NEW GUINEA: Morobe District, *Clemens 2168,* March 26, 1936, at about 600 m. alt.; Wareo, *Clemens 1578,* January 10, 1936, at about 600 m. alt.

[1]Botanical Results of the Richard Archbold Expeditions.

These specimens show only leaves, buds and immature fruit. Although with flowering material for comparison, they may prove to represent a new species, they compare most favorably with the Bornean and Javan specimens of *Meliosma ferruginea* Blume as to the indumentum, and the size and outline of the leaflets.

Meliosma sumatrana (Jack) Walpers, Annales **1**: 135. 1848; Miquel, Fl. Ind. Bat. **1**(2): 617. 1859; Hooker f. Fl. Brit. Ind. **2**: 6. 1876.

Millingtonia sumatrana Jack, Malay. Miscel. **2**(7): 30. 1822.
Meliosma Diepenhorstii Val. Ic. Bog. **2**: *t. 150.* 1904.

British North Borneo: Mount Kinabalu, Penibukan, *Clemens 30321, 30516, 31699 = 31844, 40738, 50187.*

With some hesitation we assign these collections to this species. All specimens except the last show fruit; in no. *50187* the inflorescence has not reached anthesis. The fruits compare favorably with specimens of this species from Sumatra; usually, however, the base of the petiolule is more enlarged in the Bornean material. Although we have no authentic material for comparison, on account of the differences in the shape and the size of the inner petals of the two species we have omitted *Meliosma nitida* Blume from the synonymy of this one. In this, *M. sumatrana* (Jack) Walp., the inner petals are distinctly acute and project above the filaments. In *M. nitida* Blume they are described as shorter than the filaments and repand-crenulate at the apex.

Meliosma philippinensis sp. nov.

Meliosma sumatrana sensu Merr. Enum. Philip. Fl. Pl. **2**: 518. 1923, non Walp.

Ramuli teretes, glabri; foliis impari-pinnatis, alternis, glabris, vel in rachi, costa nervisque parce puberulis, plerumque 3–4-jugis; rachi 15–23 cm. longa; petiolulis ± 1 cm. longis; foliolis suboppositis, lanceolato-oblongis ad ellipticis, acuminatis, basi in petiolum angustatis, integris vel parce dentatis, chartaceo-coriaceis, reticulatis, subtus venis prominentibus; inflorescentiis circiter 30 cm. longis, rachi ramulisque pubescentibus; floribus glabris; sepalis late rotundis; petalis exterioribus obovato-orbicularibus, circiter 1.5 mm. longis, 2 mm. latis, interioribus vix 1.5 mm. longis, filamentis paullum brevioribus, cuneatis, apice retusis vel erosis; ovario glaberrimo, disco 5-denticulato cincto; drupis subglobosis vel obovoideis, basi laterali gibberosis; putamine oblique globoso, ± 1 cm. longo, vix 1 cm. lato, osseo, dorso costato.

Philippine Islands: Mindanao, Surigao, *Wenzel 2534* (type), *2945, 3331, Mallonga* (*For. Bur. 27000*); Zamboanga District, *Ramos &*

Edaño (*Bur. Sci. 37368*); Lanao District, *Alvarez* (*For. Bur. 25173*); Bukidnon Subprovince, *Edaño* (*Bur. Sci. 39054, 39101*); Mount Apo, *Clemens* (*Bur. Sci. 15599*), *Elmer 10531, 11178, 13297, 13771.*

This species, previously included in *Meliosma sumatrana* (Jack) Walp., differs from the latter in having shorter, truncate or erose, inner petals and considerably smaller fruits (scarcely half as large as in the Sumatran material). *Meliosma philippinensis* is more like *M. nitida* Blume, of which we have neither flowers nor fruit for comparison. The description of the latter, however, indicates ellipsoid fruits twice as large as in the Philippine form.

Meliosma humilis sp. nov.

Arbor parva; ramulis subteretibus ad apicem ± dense ferrugineo-hirsutis; foliis impari-pinnatis, alternis, vulgo 4–5-jugis; rachi 20–30 cm. longa, initio hirsuta, demum glabrata; petiolulis ± 1 cm. longis, ± hirsutis; foliolis chartaceo-coriaceis, suboppositis, patentibus, in specimine typica ± 9 cm. longis, circiter 3.5 cm. latis, in ceteris usque ad 15 cm. longis, 6 cm. latis, oblongis ad ellipticis, apice acutis vel breviter acuminatis, basi subrotundatis vel superiorum acutis vel cuneatis, margine plerumque acute dentatis, reticulatis, costa venisque primariis initio hirsutis, demum glabratis, venis primariis utrinque 8–12, subtus prominentibus; inflorescentiis ± 25 cm. longis, divaricate ramosis, hirsutulis, multifloris; floribus subsessilibus vel breviter pedicellatis, glabris; sepalis ciliolatis, subrotundis; petalis exterioribus late obovato-orbicularibus, circiter 1 mm. longis, 1.5 mm. latis, interioribus infra medium dorso filamentorum adnatis, utrimque in appendiculum brevem productis; staminodiis connatis; disco subannulari quam ovario paullo breviore, 5-lobato, lobis subulatis.

BRITISH NEW GUINEA: Central Division, Mount Tafa, *Brass 5050* (type), May-September, 1933, in the valley-forest, at about 2400 m. alt. (small substage tree; leaves clustered at the ends of the branches; peduncle and pedicels reddish brown; flowers small, white and numerous). NORTHEASTERN NEW GUINEA: Morobe District, without definite locality, *Clemens 6262,* January, 1937, at 2400–3200 m. alt.; Ogeramnang, *Clemens 4465, 4828,* December 2, 1936 and January 1, 1937, at ± 2400 m. alt.; Goliteng Camp, Sarawaket Bush, *Clemens 5288,* February 1, 1937, at 2800–3200 m. alt.

This species suggests *Meliosma nervosa* Koord. & Val. in the dentation and outline of the leaflets as shown in Koord. & Val. Atlas Baumart. Java **2:** *f. 376.* 1914. It is not so glabrate a species and differs also in the subulate lobes of the disk and the shorter lobes of the inner petals (attached

near the base of the filaments). In the angles between the midrib and the primary veins of the leaf is often a dense tuft of hairs.

Meliosma sarawakensis Ridley, Kew Bull. **1933:** 193. 1933.

Meliosma grandifolia Lecomte, Bull. Soc. Bot. Fr. **54:** 676. 1907, non Urban (1895).

Borneo: Sarawak, without definite locality, *Native collector 106, 139, 2696.*

Tentatively we assign these collections to this species. They are also close to *M. latifolia* Ridley. Unfortunately, we have no authentic specimens at hand for comparison, and the descriptions alone are not sufficiently precise to make clear the differences between these two species unless we accept Ridley's character "stamina 2, hirsuta" for *M. latifolia.* In the various Malaysian species we have scanned in an effort to locate our unnamed material we have not found any hirsute stamens, the tips of the appendages of the filaments may have a few very minute hairs, but in several of the species the ovary is somewhat hirsute or tomentose.

Meliosma confertiflora sp. nov.

Ramuli teretes, fusco-cinerei, novelli tomentoso-hirsuti; foliis imparipinnatis, alternis, plerumque 3–4-jugis; rachi 18–22 cm. longa, initio tomentoso-hirsuta demum glabrata; petiolulis 5 mm. longis; foliolis suboppositis vel inferioribus alternis, 8–15 cm. longis, 3–4.5 cm. latis, lanceolatis, acuminatis, basi inaequaliter obtusis, margine integris vel sparse subulato-dentatis, subtus reticulatis, costa venisque primariis undique ± pubescentibus; venis primariis utrimque ± 10, subtus conspicuis; inflorescentiis ramosis, (in specimine typica) 9 cm. longis, 4.5 cm. latis, multifloris, rachi ramisque tomentoso-hirsutulis; floribus confertis, subsessilibus; sepalis ciliolatis, subrotundis; petalis exterioribus late rotundis vel obovatis, interioribus infra medium dorso filamentorum adnatis, utrimque in appendiculum brevem productis vel bi- tri-lobis; ovario parce pubescente.

British North Borneo: Mount Kinabalu, Dallas, *Clemens 26961* (type), *26961bis,* November 6 and 2, 1931, at about 900 m. alt.

This species, although closely approaching *Meliosma sambucina* (Jungh.) Miq. (= *M. glauca* Blume) in general habit, may be distinguished by the shorter petiolules, and the short and compact inflorescences. Although both specimens are in bud only, it does not seem as if the inflorescence could possibly grow to the size of that of *M. sambucina* (Jungh.) Miq.

Meliosma rufo-pilosa Henderson, Gard. Bull. Straits Settl. 7: 96, *t. 18*. 1933.

BRITISH NORTH BORNEO: Mount Kinabalu, Tenompok, *Clemens 28823, 28823 bis, 29909*, March 14 and June 13, 1932, at about 1500 m alt.

These collections are a good match for an isotype of *Meliosma rufo-pilosa* Henderson. This rather distinct species has been previously reported only from Pahang.

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STUDIES IN THEACEAE. IV
NEW AND NOTEWORTHY SPECIES OF EURYA

CLARENCE E. KOBUSKI

SINCE THE PUBLICATION of the synopsis of "Eurya, Subgenera Eurya and Penteurya" in 1937,[1] several new species have come to the attention of the author making a supplementary paper necessary. Besides the new species, other noteworthy recently described species and nomenclatorial notes are included. All specimens cited in this study are to be found in the herbarium of the Arnold Arboretum of Harvard University unless otherwise designated. These borrowed specimens are cited under the abbreviations NY = Herbarium of the New York Botanical Garden, New York, and SY = Herbarium of the Botanical Institute, Sun Yatsen University, Canton, China.

Eurya alata, spec. nov.

Frutex glaberrimus 2 m. altus, ramulis alatis, alis ad 1 mm. latis; foliis glaberrimis coriaceis lineari-lanceolatis 6–8 cm. longis et 1.5–2.5 cm. latis, apice obtusis retusisque, basi cuneatis, supra viridibus, subtus luteo-viridibus, margine serrulatis, petiolis 2–3 mm. longis; floribus femineis axillaribus 2–3 aggregatim dispositis, pedicellis 2 mm. longis glabris, sepalis 5 imbricatis subrotundatis apice obtusis emarginatis, basi plus minusve contractis, petalis 5 albidis basi plus minusve connatis oblongo-obovatis 2–2.5 mm. longis et 0.5–1.0 mm. latis, ovario glabro conico-globoso, stylo brevi ± 1 mm. longo 3-fido, ovario ignoto.

KWANGTUNG: Pan-Ling Tsze, Pei-Koong, North River, in dense woods, *W. Y. Chun 5924,* Dec. 25, 1927 (shrub 2 m. with white flowers).

An interesting feature of this species is the outstanding winged condition on the very young branchlets with wings as much as 1 mm. long making the branchlets appear almost quadrangular. In the older branchlets, the wings are reduced to pronounced ridges which seem to zigzag along the stem. *Eurya alata* because of the texture, veining and symmetry of its leaves, resembles *E. glaberrima* Hayata from Formosa. However, it can be separated from the latter by its winged stem, longer style and delicate corolla. In *E. glaberrima,* according to Hayata, the

[1]Kobuski in Ann. Missouri Bot. Garden, **25**: 299-359. 1937.

style, being only 0.25 mm. long, is one of the shortest in the genus. In *E. alata* the style measures ± 1 mm. in the flower.

Eurya Brassii, spec. nov.

Frutex prostratus vel adscendens (ex collectore), ramulis pubescentibus; foliis dense dispositis distichis glabris coriaceis obovatis vel ovatis 1–2 cm. longis et 0.7–1.2 cm. latis, apice obtusis retusis, basi cuneatis, margine serrulatis revolutis, venis supra profunde impressis reticulatis, petiolis 1–1.5 mm. longis; floribus pistillatis axillaribus singularibus vel binis, pedicellis ca. 1.5 mm. longis, bracteis sepaloideis, sepalis 5 inaequalibus ca. 2 mm. longis et 1.5 mm. latis, margine glandulosis, petalis 5 albidis breve connatis, obtusis 3 mm. longis et 1.0–1.5 mm. latis, ovario ovato ca. 2 mm. longo et 1.25 mm. lato, stylo ca. 0.5 mm. longo tripartito, floribus masculis axillaribus singularibus vel binis, pedicellis ca. 1 mm. longis, bracteis sepaloideis, sepalis 5 inaequalibus 2–3 mm. longis et 1–2 mm. latis, margine glandulosis, petalis 5 albidis breviter connatis obovatis, 3–4 mm. longis et 3 mm. latis, staminibus 8–13, filamentis 2 mm. breviter connatis, antheris 1 mm., ovario rudimentario; fructu maturo ignoto.

PAPUA: Central Division, Wharton Range, Murray Pass, grassland ridge crests, alt. 2840 m., *L. J. Brass 4185* ♀ (TYPE), June-Sept. 1933 (common prostrate or ascending shrub often rooting from branches; corolla white; fruit dark blue).— Central Division, Mt. Albert Edward, in low thickets on summits of low ridges on grasslands, alt. 3680 m., *L. J. Brass 4499* ♂ May-July 1933 (common, low, dense-foliaged shrub with white flowers).

Eurya albiflora White is one of the closest relatives of *E. Brassii.* Both species have small (1–2 cm. long) distichous coriaceous leaves with nerves deeply impressed on the upper surface. However, White's species is a shrub or small tree up to 6 m., while *E. Brassii,* according to the collector, is a prostrate or ascending shrub with a tendency to root from the branches. Also in *E. albiflora* the branchlets and underside of the leaves are densely pubescent with long brown hairs while in *E. Brassii* the branchlets except for the very young growth are quite glabrous and the leaves are always glabrous.

Another relative is *E. Hellwigii* Lauterbach. In Lauterbach's species, the leaves are usually 3 cm. or over in length and about 2 cm. wide and have up to nine pair of veins. The habit is that of a tree (3–5 m.). In *E. Brassii* the leaves are not only distinctly smaller but there are hardly ever more than five or six pair of veins.

Eurya brevistyla, spec. nov.

Ramuli glabri subalati brunnei vel griseo-brunnei; foliis coriaceis glabris obovatis vel ellipticis 4.0–6.5 cm. longis et 1.8–2.5 cm. latis, apice acuminatis, basi cuneatis, margine serrulatis, petiolo 3.5 mm. longo, glabro; floribus ignotis; fructibus axillaribus globosis vel subglobosis glabris ca. 5 mm. longis et 4–5 mm. latis, pedicello ca. 1.5 mm. longo glabro, bracteis 3 inaequalibus glabris sepaloideis minute apiculatis, sepalis 5 inaequalibus concavis glabris ca. 2.0 mm. longis orbicularibus vel suborbicularibus, margine papyraceis, stylo tripartito brevissimo ca. 0.25 mm. longo.

SZECHUAN: Ma-pien Hsien, *F. T. Wang 23083,* May 29, 1931.

The very short style (0.25 mm.) is a most unusual character for this genus, especially in China. It is sufficient to separate the species from all other glabrous Chinese species. The spreading stigmas are longer than the style. There were no flowers on the specimen. *Eurya brevistyla* can be separated from *E. nitida* its nearest Chinese relative by the short style, the obovate leaves and the short pedicels of the fruit.

Eurya cavinervis Vesque in Bull. Soc. Bot. France, **42:** 158. 1895.

Eurya Handeliana Kobuski in Ann. Missouri Bot. Gard. **25:** 309. 1937.
Eurya aurescens sensu Handel-Mazzetti, Symb. Sin. **7:** 400. 1931, quoad descript. excl. syn.; non *Eurya japonica* Thunberg var. *aurescens* Rehder & Wilson.

INDIA: Sikkim, *J. D. Hooker* in 1859 (TYPE in Mus. d'Hist. Nat. Paris, fragment & photo. AA).— Burma, between Sadon and the Yunnan-Chinese border at Changtifang and Kambaiti, alt. 2750 m., *J. F. Rock 7046,* Nov. 1922 (shrub 5–8 ft. in moss forest).— in thickets, Fort Hertz, Hkamti Plain, alt. 360 m., *F. Kingdon Ward 9060,* Dec. 23, 1930 (bushy evergreen with white flowers).

CHINA. Yunnan: exact locality lacking, *G. Forrest 15692* (HOLOTYPE of *E. Handeliana*).— *G. Forrest 8922, 8940, 11944, 17519, 21537.— H. Handel-Mazzetti 8724.— C. Schneider 2488, 2793.— J. F. Rock 3157, 8066.— C. Wang 63268, 67060, 67441, 67497, 72041, 72044, 72413.*

Eurya cavinervis has remained in obscurity since its publication by Vesque in 1895. Recently, a leaf specimen of the type (*Hooker,* Sikkim, collected in 1895) was obtained from the Herb. Mus. Paris and it proves to be identical with the species described by me in 1937 as *E. Handeliana.* The deeply impressed veins on the dorsal surface of the shining coriaceous leaves, together with the leaf size are outstanding features of the species not to be mistaken for any other species of *Eurya.*

Eurya cavinervis Vesque var. **strigillosa** (Handel-Mazzetti), comb. nov.

Eurya nitida Korthals var. *strigillosa* Handel-Mazzetti, Symb. Sin. **7**: 400. 1931.

YUNNAN: in dense mixed forest near the town Hsiangschuiho, between Dali [Talifu] and Lidjiang [Likiang], alt. 2750 m., *H. Handel-Mazzetti 6453* (ISO-HOLOTYPE of *E. nitida* var. *strigillosa*, SY).— *C. Wang 63677, 66749*. SZECHUAN: in forest, Mt. Omei, alt. 2400 m., *T. T. Yü 480*, April 21, 1932 (shrub 5 ft. with white flowers and leaves dark green above).— *Science Institute of West China 3793* in 1932.

Shining coriaceous dark-green leaves with deeply impressed or channeled veins on the upper surface and raised on the under surface are the characters which ally this variety to *E. cavinervis* rather than *E. nitida* as Handel-Mazzetti had thought. The pubescent character of stem and flower-parts, together with the terete stem, are features which separate it from its species, *E. cavinervis*.

Eurya chuekiangensis Hu in Bull. Fan Mem. Inst. Biol., Bot. Ser. **8**: 147. 1938.

NORTHWESTERN YUNNAN: in forest, Bar-Ru-La, Salween-Chue-Kiang Divide, alt. 3000 m., *C. Wang 67407* ISOTYPE, Oct. 1935 (bushy shrub, 5 ft. high with greenish black fruit).

This species is glabrous throughout even to the terminal buds. Unusual features are the very short style (0.25–0.75 mm.) and the conico-rostrate fruit. The latter character is found only occasionally in this genus. Most species are characterized by distinctly globose fruit. As in most perfectly glabrous species, the young branchlets are winged, however, only slightly so in this species.

Eurya dasyclados, spec. nov.

Frutex 1 m. minusve altus, ramulis crassis, teretibus ferrugineo-pilosis; foliis coriaceis rigidis oblongo-ovatis 7–10 cm. longis et 2.5–3.5 cm. latis, basi subrotundatis subcordatis vel cuneatis, apice obtuse acuminatis, supra flavo-viridibus, venis utrinque elevatis, reticulatis, costa subtus pilosis, margine glanduloso-serrulatis revolutis, petiolis crassis parvis 3 mm. minusve longis dense pilosis; floribus pistillatis 3–4 axillaribus subsessilibus vel pedicellis 1 mm. longis, bracteis sepaloideis inaequalibus pilosis, sepalis 5 imbricatis inaequalibus concavis obtusis ca. 1.5 mm. longis sparse pilosis, petalis 5 ca. 2 mm. longis acuminatis, basi adnatis, 0.75 mm. latis, apice 0.25 mm. latis, ovario 2 mm. longo, globoso, glabro, stylo tripartito, 1 mm. longo, ad basim libero; floribus masculis ignotis; fructibus subglobosis, glabris, 4 mm. longis, nigrescentibus.

KWANGSI: Tong Shan (along Kwangtung border), near Sap-luk Po village, Waitsap District, *W. T. Tsang 22790,* TYPE, Sept. 15, 1933 (fairly common; dry sandy soil, silt; scattered shrubs 2 ft. high; fruit dark blue). KWANGTUNG: Sam Kok Shan, Tsungfa-Lungmoon Districts, *W. T. Tsang 20431,* May 11, 1932 (roadside, dry place; shrub 1 m. tall with black fruit).— Sam Kok Shan, Cheung Uk Village, Ts'ung-hwa (Tsung-fa) District, *W. T. Tsang 24846,* Mar. 1–16, 1935 (abundant; thicket, three feet high; fruit black).— Chaochow District, *N. K. Chun 42631,* April 5–May 1, 1931 (shrub in woods).

This species is characterized by thick sturdy terete branches covered with a dense ferruginous pilose pubescence for the first year's growth and dense patchy black pilose pubescence for the second and third year's growth. Its nearest relative, the recently described *E. rugosa* Hu has the same pubescence for the initial year's growth, after which it becomes glabrescent. Also, the branchlets appear terete for the first year in *E. rugosa,* but in the second year appear, as Hu puts it, somewhat winged.

The leaves are coriaceous, rigid, oblong-ovate, 7–10 cm. long and 2.5–3.5 cm. wide and are yellowish or metallic green in color. The venation presents a most interesting character. At first glance, it appears that the veins are impressed on the upper surface. This is caused by successive depressions in the leaves (at least, in the dried state) at each primary lateral vein. However, on close observation one finds that the veins, even to the secondary and cross-veins, are distinctly raised on both surfaces. In *E. rugosa* the veins are deeply impressed, like channels on both surfaces.

The same pilose pubescence of the very young growth is sparse on the lower surface, especially along the midrib. In the type specimen (fruiting) the calyx, especially along the central line, the bracts and pedicels are covered with dense ferruginous hairs. This is less noticeable in the flowering specimen from Kwangtung.

The corolla-lobes are very narrow in comparison with those of other species of *Eurya* and taper from 0.75 mm. at the base where they are adnate for 1 mm. to 0.25 mm. near the acuminate apex.

The ovary and fruit are both glabrous. In *E. rugosa* the ovary is not known. However, in Hu's species the fruit resembles that of *E. trichocarpa* Korthals in being glabrescent and in both species only the presence of occasional hairs show that the fruit was once pubescent. When a flowering pistillate specimen is eventually collected, the ovary probably will be covered with a dense hoary pubescence like that of *E. trichocarpa* in flowering condition.

Eurya dasyclados, to date, is confined to Kwangsi (along the Kwang-

tung border) and Kwangtung, while *E. rugosa* Hu is found in Szechuan.

Eurya Huiana, spec. nov.

Arbor vel frutex, 2–7 m., ramulis pubescentibus teretibus rubro-brunneis; foliis coriaceis glabris raro costis puberulentis ellipticis vel oblongo-ellipticis vel oblongo-obovatis 6–8.5 cm. longis et 2.5–3 cm. latis, basi cuneatis, apice acuminatis, supra nitide viridibus, subtus pallide viridibus, margine glanduloso- serrulatis, venis subobscuris, petiolis ca. 5 mm. longis glabris; floribus femineis masculisque ignotis; fructibus nigrescentibus globosis glabris ca. 5 mm. diam. pedicellis ca. 2 mm. longis glabris bracteis 2 sepaloideis glabris, sepalis 5 imbricatis inaequalibus glabris 2 mm. longis et 1.5 mm. latis subrotundatis, stylo ca. 2 mm. longo tripartito ad 1 mm. supra basim.

KWEICHOW: on slope in forest, Miao Wang, Kiangkou Hsien, alt. 600 m., *A. N. Steward, C. Y. Chiao & H. C. Cheo 569,* TYPE AA, ISOTYPE NY, September 27, 1931 (shrub 2 m. with black fruit).— In open, Hei-shui-chee, Shih tsien san District, *Y. Tsiang 4173,* in 1930 (small tree 1 m.; leaves green above, pale green beneath).— In densely shaded mixed woods, Wai-ho, Kweiting, alt. 600 m., *Y. Tsiang 5604, 5609,* July 6, 1930 (shrub, 3 m.; leaves lustrous green above, light green below; fruit green) (AA, NY, SY).— In light woods, foot of Vanchingshan, Kiangkow, alt. 450 m., *Y. Tsiang 7491, 7498,* Dec. 8, 1930 (small tree 4 m.; leaves coriaceous, deep lustrous green above, light green below; fruit black) (AA, NY).— In densely shaded ravine, Vanchingshan, Yinkiang, alt. 400–500 m., *Y. Tsiang 7728,* Dec. 19, 1930 (tree 8 m. with leaves deep lustrous green above, light green below; fruit black).— In dense woods, Vanchingshan, Yinkiang, alt. 600 m., *Y. Tsiang 7824* Dec. 25, 1930 (small tree 7 m.; leaves deep sublustrous green above, light green below; fruit black) (AA, NY).

HUNAN: shady slope, Ma-Ling-Tung, Sinning Hsien, alt. 650 m., *C. S. Fan & Y. Y. Li 585,* Oct. 9, 1935 (shrub 3 m.; fruit becoming black when ripe).

Most workers of this genus have identified this species with *E. nitida* Korthals. In general appearance there is a great resemblance between the two species. However, *E. Huiana* has pubescent leaf buds, young branchlets and occasionally puberulent midribs, which immediately separate it from the strictly glabrous *E. nitida.* The stems of this newly described species are terete in contrast to the winged stems of *E. nitida.*

Some of the *Tsiang* specimens, especially *5604, 5609, 7491* and *7498* have leaves larger than those described from the type. These specimens have leaves 7–10.5 cm. long and 2.5–4.8 cm. wide. On the other hand,

Tsiang 4173, 7824, 7728 and *Fan & Li 585* have leaves corresponding in size to those of the description.

Unfortunately all the specimens cited are fruiting specimens, so that it is impossible to give a description of the flowers at this time.

It is a pleasure to name this distinct species in honor of Professor Hsen Hsu Hu, the Chinese botanist who not only has contributed much to the knowledge of Chinese Theaceae but has also been an inspiration to many students of botany in China.

Eurya impressinervis, spec. nov.

Frutex vel arbor parva glabra, ramulis prominenter alatis glabris; foliis membranaceis glabris ovatis (vel obovatis) 7–11 cm. longis et 2–3 cm. latis, basi cuneatis, apice acuminatis margine serrulatis, nervis supra impressis, subtus acute elevatis, petiolo 2–5 cm. longo glabro; floribus masculis in axillis foliorum solitariis vel binis ut videtur, pedicellis glabris 2.0–2.5 mm. longis, bracteis sepaloideis, sepalis 5 imbricatis inaequalibus suborbicularibus concavis apiculatis margine glandulosis, petalis 5 basi paulo adnatis obovatis 5 mm. longis et 1.5–2.5 mm. latis, staminibus 15, filamentis ca. 2 mm. longis, antheris lobatis 2 mm. longis, ovario rudimentario; floribus femineis 2–4 in axillis foliorum, pedicellis glabris ca. 2.5 mm. longis, bracteis sepaloideis, sepalis 5 imbricatis inaequalibus 1.25 mm. longis, apice obtusis glanduloso-apiculatis, petalis 5 basi paulo connatis, linearibus, apice obtusis retusis ca. 3.25 mm. longis et ca. 1 mm. latis; ovario ovato 1.5 mm. longo et 0.75 mm. lato, stylo 1.75 mm. longo tripartito, stigmatibus 3; fructibus immaturis globosis ca. 3 mm. longis latisque, pedicellis 3 mm. longis.

KWANGSI: exact locality and date lacking, *C. Wang 40569* TYPE, *40504, 83567, 39482.*— Virgin forest, Lao Shan, Loh Hoh Tsuen, Lin Yuin Hsien, alt. 1800 m., *A. N. Steward & H. C. Cheo 418,* May 16, 1933 (shrub 5 m. high) (AA, NY).— In forest, Chu Feng Shan, 30 li s.w. of Shan Fang, N. Luchen, alt. 725 m., *R. C. Ching 5827* (rare tree 6 m. high; light shining green leaves with impressed nerves above) (NY, SY).— Locality lacking, *R. C. Ching 5981,* June 14, 1928 (SY).

The outstanding characters of this species are the membranaceous leaves and the depressed venation on the upper leaf surface. The veins on the lower surface are sharply raised and light in color. Depressed venation, even to a greater degree, is found in other species such as *E. cavinervis* and *E. Metcalfiana.* However, in both these latter species, the leaves are very coriaceous. The winged condition of the branchlets in *E. impressinervis* is more pronounced than is usually found in the genus.

This species, so far as is known, is confined to Kwangsi. Unfortunately, the field notes for the C. Wang - Kwangsi collection, which includes the type, are not available at present, but the data concerning the exact locality, date of collection and miscellaneous notes pertaining to the specimens will be completed as soon as the notes arrive.

Eurya lanciformis, spec. nov.

Arbor 10 m. (ex collectore), ramulis alatis cinereis glabris, innovationibus leviter pubescentibus; foliis coriaceis glabris lanceolatis vel oblongo-ovatis, supra nitido-viridibus subtus pallido-viridibus, apice acuminatis, basi cuneatis, margine undulatis, 7–10 cm. longis et 1.3–2.5 cm. latis, venis undique elevatis, petiolo 3–5 mm. longo glabro; floribus ignotis; fructibus globosis purpureis 4–5 mm. longis, pedicello 3–4 mm. longo glabro, bracteis parvis 2 sepaloideis, sepalis 5 glabris inaequalibus suborbicularibus ca. 1.5–2 mm. longis et 1.5 cm. latis, margine glandulosis, stylo tripartito ca. 2 mm. longo.

KWANGSI: in woods, Seh-fing, Dar Shan, S. Nanning, alt. 750 m., *R. C. Ching 8106* (NY, TYPE; SY), Oct. 21, 1928 (tree 30 ft. with gray bark; leaves thick, glossy green above, light green below; fruit oblong-ovate, dark purple).

The type of this species was identified formerly as *E. nitida*. There is a resemblance to this species. However, *E. lanciformis* resembles more closely *E. japonica* in that the leaves are slender-elongate and the leaf-margin is undulate-serrate rather than sharply serrate as in most species of the genus. The lower third of the leaf-margin is nearly entire.

The unfolding leaf-buds are sparsely pubescent on the very young petioles. This is the only pubescence on the whole plant and this in turn becomes glabrescent before the leaves are mature. This pubescence would not be observed unless one should be looking for just this feature. Otherwise, it is a typical glabrous species with winged branchlets.

Eurya Metcalfiana, spec. nov.

Frutex humilis, ramulis glabris; foliis persistentibus coriaceis glabris ellipticis vel oblongo-ellipticis, 2.0–3.5 cm. longis et 8–15 mm. latis, basi cuneatis, apice breviter obtuse acuminatis, margine serrulatis, nervis utrinque 7–10, supra profunde impressis, subtus leviter elevatis, brevissime petiolatis, petiolis ca. 1 mm. longis; floribus masculis in axillis foliorum solitariis (ex specimine) fragrantibus, pedicellis glabris 1–2 mm. longis, bracteis 2 sepaloideis, sepalis 5 imbricatis glabris concavis obtusis inaequalibus ca. 3 mm. longis et 2.5 mm. latis, petalis 5 basi connatis albidis obtusis ca. 5 mm. longis et 2–3 mm. latis, staminibus 10, fila-

mentis 3 mm. longis, antheris basi lobatis 1.5 cm. longis, ovario rudimentario, floribus femineis ignotis; fructo immaturo globoso, stylo 0.25 mm. longo.

KWANGTUNG: in thicket, Lo Hai Ngan Sam Kok Shan, Cheung Uk Village, Ts'ung-hwa (Tsung-fa) District, *W. T. Tsang 24842* TYPE (woody 2 ft. high; flowers white, fragrant). ANHWEI: open rocky ridge, Whang Shan, S. Anhwei, alt. 1400 m., *R. C. Ching 2992*, July 13, 1925 (common low dense shrub with gray bark; leaves glossy green above, pale below) (AA, SY).— Yellow Mt., alt. 1800 m., *M. Chen 1243, 1262, 1319* (SY).

Because of its deeply impressed nerves on the upper surface of the leaf this species resembles somewhat *E. Fangii* Rehder and *E. cavinervis* Vesque. However, *E. Fangii* is characterized by pubescence on the young leaves and branchlets, a more sharply acuminate leaf with sharper serrations. In *E. Metcalfiana* the leaf buds and young growth in general are strictly glabrous. *Eurya cavinervis*, although also strictly glabrous, is a much more robust species with larger leaves and is confined to India and Yunnan, while *E. Fangii* as far as known, is found only in Szechuan.

This species is named in honor of Prof. Franklin P. Metcalf of Lingnan University. Professor Metcalf has been associated with Chinese botany for over a decade and has contributed much to our knowledge of the flora of Fukien and Kwangtung.

Eurya obovata (Blume) Korthals in Temminck, Verh. Nat. Gesch. Bot. **3:** 118. 1840.— For further citations and synonymy see Kobuski in Ann. Missouri Bot. Gard. **25:** 343. 1937.

Distribution: Celebes, Java (fide Korthals), Sumatra, Borneo.

BORNEO. Mt. Kinabalu: Upper Kinabalu, *J. & M. S. Clemens 27833, 28990, 29881, 30347, 50813, 50879.*

Eurya obovata (Blume) Korthals var. **platyphylla,** var. nov.

A specie typica differt foliis majoribus 5–9 cm. longis et 3.5–4 cm. latis vel foliis 3.5–5.5 cm. longis et 2–3.5 cm. latis in speciminibus ad var typicam accedentibus.

BRITISH NORTH BORNEO. Mount Kinabalu: Hill thicket, Marai Parai, alt. 1500 m., *J. & M. S. Clemens 32344* (TYPE), March 22–24, 1933.— Also *J. & M. S. Clemens 30862, 32413, 35094, 40871, 40883, 50009, 50298*, at 1200–1800 m. alt.; *29800, 33108, 33946, 50621, 50986, 50989, 55093* at 2400–2750 m. alt.

On examining material collected by J. & M. S. Clemens on Mt. Kina-

balu, British North Borneo, one is bewildered by the fact that the field numbers and dates of collection lack correlation. Higher numbers have often been given to material collected at an earlier date than the low number. Also, accurate altitude records have not been recorded on all labels. This last may be due to copying the label, since on the only original field label seen, the altitude has been recorded.

For this species and its variety, nearly twenty-five specimens were obtained from Mt. Kinabalu, and if there was a reasonable correlation between date, number and altitude, one might be able to show with confidence a fine series of gradation from the small-leaved *E. obovata* to the large-leaved variety *E. obovata* var. *platyphylla*. As it is, the series must be filled in with material labeled merely "alt. 6000–13500 ft."

Even so, the species itself is found to occur at an altitude of about 3300 m. and is characterized by small coriaceous leaves, 1.5–3 cm. long, 1–1.5–2 cm. wide with the veins deeply impressed on the upper surface and raised on the lower surface. At the other extreme and at an altitude of 1200–1800 m. is found the large-leaved variety here described. This is characterized by leaves 5–9 cm. long and 3.5–4 cm. wide with veins distinctly raised on both surfaces.

Examining only the diverse material mentioned above, one would not hesitate separating the two as widely distinct species. However, at an altitude of 2400–2750 m. is found an intermediate stage with leaves 3.5–5 cm. long and 2–3.5 cm. wide. Some leaves have impressed veins on the upper surface while others have raised veins such as are found on the large-leaved specimens, and still others have raised veins with impressed channels. Examples of the diverse venation can be found on a single branchlet.

Rather than designate two varieties, one for the large-leaved and one for the intermediate stage, I am including both under the single variety described above.

Eurya pahangensis, spec. nov.

Frutex [vel arbor ?], ramulis cinereo-brunneis teretibus pubescentibus asperatis; foliis subcoriaceis oblongo-ovatis 5–7.5 cm. longis et 1.5–2.5 cm. latis pubescentibus, supra nitidis, basi cuneatis, apice acuminatis, margine serrulatis, venis utrinque elevatis, petiolis ca. 2 mm. longis pubescentibus; floribus femineis axillaribus 2–3, pedicellis ca. 2 mm. longis pubescentibus, bracteis 2 pubescentibus sepaloideis, sepalis 5 imbricatis inaequalibus suborbicularibus ca. 1.5 mm. longis, petalis 5 ca. 2.5 mm. longis et 1.5 mm. latis, apice obtusis, basi connatis, ovario subgloboso dense cano-pubescente, stylo ad medium 4- vel 5- fido; fructibus ignotis.

FEDERATED MALAY STATES: Pahang, Fraser's Hill, *E. J. H. Corner* (Singapore Field Number *33241*), August 19, 1937.

This species is characterized by a dense hoary pubescence on the ovary, 4–5-fid style and rough, pubescent, terete, gray branchlets. *Eurya trichocarpa,* its nearest relative, has a sparse pubescence confined almost solely to the terminal bud, 3-fid style and smooth, shining, almost glabrous reddish branchlets.

Eurya paratetragonoclada Hu in Bull. Fan Mem. Inst. Biol., Bot. Ser. 8: 149. 1938.

SOUTHWESTERN YUNNAN: in forest, Che-tse-lo, alt. 3200 m., *H. T. Tsai 58438,* ISOTYPE, Sept. 8, 1937 (tree 4 m. with blue fruit).

In his description of this species, Hu refers repeatedly to the pubescence. In the genus *Eurya,* the terminal bud is rather a good criterion of the general glabrous or pubescent condition of the whole plant. In this species, the isotype shows the terminal bud to be strictly glabrous and I fail to find any pubescence on either surface of the leaves. The mere fact that the young branchlets are angled would lead one to infer that the plant would be glabrous since these two characteristics usually go together. Hu also refers to the sepals and fruit as "with scattered hairs." Unfortunately, my isotype is sterile so that I can merely conjecture that these also might be glabrous.

In the English description the internodes are said to be "7 to 1.5 mm. long." This should read 7 to 15 mm. long.

Eurya pentastyla, spec. nov.

Frutex [vel arbor ?], ramulis rubro-brunneis, innovationibus pubescentibus, alatis pubescentibus secundum alas axillasque ceterum glabris; foliis coriaceis glabris oblongo-ovatis 6.5–8.5 cm. longis et 1.5–2.3 cm. latis, basi cuneatis, apice acuminatis, venis obscuris utrinque elevatis, margine subundulato-serratis minutissime glandulosis, petiolis ca. 2 mm. longis; floribus ignotis; fructibus axillaribus 3 glabris globosis ca. 4–5 mm. longis, pedicellis glabris 3 mm. longis, bracteis 2 distinctis sepaloideis, sepalis 5 imbricatis glabris subrotundatis inaequalibus 1.5–2 mm. longis et ca. 1.5 mm. latis, stylo ad trientem inferiorem 5-partito, 3 mm. longo.

SUMATRA: vicinity of Tomoean Dolok, Asahan, alt. 1000 m., *Rahmat Si Boeea 9027,* TYPE, June 10–15, 1936.— Same locality, *Rahmat Si Boeea 9076,* June 10–15, 1936.— The summit, Tor Matoetoeng, Asahan, alt. 1792 m., *Rahmat Si Boeea 9417,* July 10–15, 1936.

This Sumatran species is characterized by 5-parted styles, pubescent

leaf-buds and winged stems with a fine pubescence in the angle of the wings, and glabrous fruit, in so far as one can be sure from an examination of a mature fruiting specimen.

Unusual is the combination of pubescent leaf-buds and winged stems, as is the pubescence in the angles of the wings. Generally one associates winged stems in *Eurya* with strict glabrity.

The nearest relative is Malayan-Chinese *E. trichocarpa* Korthals. This latter species has a 3-parted style, pubescent leaf-buds with terete stems and pubescent ovary which in fruit becomes glabrescent. This glabrescent condition may be found to apply to *E. pentastyla* when flowering specimens can be examined.

Eurya pittosporifolia Hu in Bull. Fan Mem. Inst. Biol., Bot. Ser. 8: 150. 1938.

SOUTHWESTERN YUNNAN: in dense forest, Che-li-Hsien, Dah-Meng-Lung, Meng-Soong, alt. 2000 m., *C. W. Wang 78362* (ISOTYPE AA), Sept. 1936 (common tree 6 m.).

The pubescent ovary and 5-parted styles are excellent distinguishing features of the species. The styles are 3 mm. long and distinct rather than connate. Other significant diagnostic characters are the puberulent terminal buds covered with dense white pubescence and the glabrous, long-acuminate leaves.

Eurya quinquelocularis, spec. nov.

Arbor 3–10 m., ramulis cinereo-brunneis teretibus pubescentibus; foliis membranaceis oblongo-ovatis 7–15 cm. longis et 2–4 cm. latis, subtus leviter pubescentibus, basi cuneatis, apice acuminatis, venis supra impressis, subtus elevatis, margine serrulatis, petiolis 2–3 mm. longis; floribus femineis 5–6 axillaribus, pedicellis pubescentibus 6 mm. longis, bracteis 2 ca. 1 mm. longis pubescentibus sepaloideis, sepalis 5 imbricatis pubescentibus inaequalibus concavis, 2–2.5 mm. longis et ca. 2 mm. latis orbicularibus, petalis 5 orbicularibus 3 mm. longis 1.5 mm. latis basi connatis 1 mm., ovario globoso glabro 5-loculari, stylo 3–3.5 mm. longo, 5-partito, basi connato 1 mm.; floribus masculis ignotis; fructibus globosis quinquelocularibus 6 mm. latis nigrescentibus.

KWANGSI: in woods, Chu Feng Sha, 30 li southwest of Shan Fang, N. Luchen, alt. 600 m., *R. C. Ching 5794* (TYPE AA; ISOTYPE NY, SY), June 7, 1928 (tree 30 ft. [diameter 1 ft.] with gray bark; leaves lustrous green above, pale below; fruit green turning to black).— Shap Man Taai Shan, Nam She Village, southeast of Shang-sze, Kwangtung Border (Shang-sze District), *W. T. Tsang 24560, 24753,* Oct. 22 - Nov. 26,

1934.— Precise locality and date of collection lacking, *C. Wang 39002, 39941.*— Midway up mountain side, Pingnan, Lo Huo'ng, Iu Shan, *Kwangsi Museum 200,* Jan. 13, 1924 (shrub 5–6 ft. with brown bark) (SY).— Hillside in woods, at foot of mountain, Pingnan, *Kwangsi Museum 760,* Dec. 25, 1923 (shrub 5–6 ft. with brown bark) (SY). YUNNAN: in forest, Mengtse, alt. 1525 m., *A. Henry 10372* (tree 10 ft. with yellowish flowers) (AA, SY).

This species is characterized by a 5-celled fruit and 5-parted style, membranaceous leaves with impressed veins on the upper and raised veins on the lower surface. Long pedicels (6 mm.) cause the flowers and fruit to stand out from the stem.

This species should not be confused with *E. pentastyla* Kobuski of Sumatra. The only relationship of note is the 5-styled condition of flower and fruit. The nearest relative is perhaps *E. cerasifolia* (D. Don) Kobuski from which it can easily be separated by the 5-styled flowers and fruit mentioned above.

Eurya rugosa Hu in Bull. Fan Mem. Inst. Biol., Bot. Ser. 8: 151. 1938.

WESTERN SZECHUAN: in thickets, Ping-Shan Hsien, alt. 1600 m., *F. T. Wang 22685,* ISOTYPE, April 16, 1931 (shrub).

This species is very distinct and is characterized by thick rugose leaves with impressed venation on both surfaces. The venation character separates it quickly from *E. dasyclados* Kobuski which possesses raised venation on both surfaces. Also in the latter species the fruit is glabrous while *E. rugosa* has fruit which is minutely pilosulose soon becoming glabrescent.

Hu says that the young branchlets are "terete ferruginous-villosulose, striate, more or less winged and glabrescent in age." This so-called winged condition, although very slight, is unusual on a species as distinctly pubescent as *E. rugosa.* Generally speaking, the species seems to be glabrescent after the first year's growth. In *E. dasyclados* the branchlets are densely pilose on the second and third year's growth.

Eurya rugosa, according to Hu, possesses styles which are two-parted and adnate at the base. All the styles examined on the isotype deposited at the Arnold Arboretum are three-parted and split to the base. Occasionally some appear two-parted but a closer examination shows that the third-part has been broken off near the base.

Eurya subintegra, spec. nov.

Frutex, ramulis alatis glabris rubro-brunneis; foliis coriaceis glabris, ad 10 cm. longis et 3.5 cm. latis, acuminatis, basi cuneatis, margine

integris vel subintegris raro crenulato-serrulatis, venis undique leviter elevatis, petiolis ca. 1 cm. longis; floribus ignotis; fructibus immaturis ovatis, pedicellis 4–5 cm. longis glabris, bracteis sepaloideis, sepalis 5 glabris inaequalibus ca. 1.5–2 mm. longis et 2.5 mm. latis, stylo ca. 1.5–2 mm. longo tripartito.

KWANGSI: Taai Ip Wong Ming Shue, Shap Man Taai Shan, near Iu Shan village, s.e. of Shang-sze, Kwangtung Border (Shang-sze District), fairly common in silt and swamp, *W. T. Tsang 22212* TYPE, May 5, 1933, (scattered shrubs, 1 m.; fruit dark blue).— Shap Man Taai Shan, near Iu Shan village, s.e. of Shang-sze, Kwangtung Border (Shang-sze District), abundant in clay soil, *W. T. Tsang 22256,* May 10, 1933 (3.5 m. high; fruit dark blue).

The entire or nearly entire leaves of this species recall to mind *E. Macartneyi* Champion. However, in *E. Macartneyi,* the stems are terete even though the species is strictly glabrous, an unusual combination of characters in the genus. In *E. subintegra* the winged or angled stem accompanies the glabrous condition of the whole specimen.

There are slight differences between the two specimens cited, but these do not appear sufficiently important to separate the two specifically. In *Tsang 22256,* the leaf is larger (13 cm. × 4 cm.), obovate and tapers to a longer point. Unfortunately, in this specimen the styles are broken off at the point of articulation making it difficult to estimate their length. In *Tsang 22212,* the type, the young branchlets are definitely alate whereas in *Tsang 22256,* the young branchlets are only angled.

HERBARIUM, ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

STUDIES IN THE BORAGINACEAE, XIII
NEW OR OTHERWISE NOTEWORTHY SPECIES, CHIEFLY FROM WESTERN UNITED STATES

IVAN M. JOHNSTON

Heliotropium molle (Torr.), comb. nov.

Heliophytum molle Torr. U. S. & Mex. Bound. Bot. 138 (1859).
Tournefortia mollis Gray, Proc. Am. Acad. **10**: 50 (1875); not Muell. (1858).
Tournefortia monclovana Wats. Proc. Am. Acad. **18**: 120 (1883).

TEXAS: plains south of Santiago Peak, 1883, *Havard 46½* (G). COAHUILA: mountains 24 mi. north of Monclova, Sept. 1880, *Palmer 887* (TYPE of *T. monclovana,* G); Movano, July 1910, *Purpus 4555* (G); 19 mi. south of Laguna del Rey, a colony on silty floor of a broad valley, with *H. Greggii,* fl. white, leaves thickish, gray, crisped, Sept. 20, 1938, *Johnston 7803* (G).

The type of *H. molle* was collected by Bigelow near Presidio del Norte (i.e. near Ojinaga), northern Chihuahua. The collection made by Palmer (no. 887) north of Monclova, Coahuila, the type of *T. monclovana,* is unquestionably conspecific. During my travels in Coahuila and Chihuahua, last year, I observed this species at only three localities. In each, it formed large though restricted colonies on dry silty valley-floors or dry sandy stream-ways. The plant spreads underground by rhizomes. The herbaceous stems, 2–3 dm. tall, were numerous at each station but may have come from the rhizomes of a relatively small number of individual plants. I noted the species (1) south of Laguna del Rey near Mohovano (specimen cited above), (2) near the Coahuila-Chihuahua boundary near Guimbalete, and (3) in northern Chihuahua in the type-region between Mula and Ojinaga. The species has a dry velvety fruit which breaks into two-seeded halves at maturity. The halves of the fruit contain two well-developed fertile cells and no infertile cavities. The plant unquestionably belongs to *Heliotropium* and can not possibly be kept in *Tournefortia.*

Heliotropium assurgens, nom. nov.

Heliotropium phyllostachyum var. *erectum* Macbride, Proc. Am. Acad. **51**: 542 (1916); not *H. erectum* Lam. (1778).
Anchusa incana Sesse & Mociño, Fl. Mex. 33 (1893) and ed. 2, 30 (1894); not Ledeb. (1847), nor *H. incanum* R. & P. (1799).

SONORA: Querocoba, Rio Fuerte, *Gentry 2247* (G). SINALOA: Culican, Oct. 24, 1904, *Brandegee* (G, TYPE of var. *erectum*). JALISCO: Jalisco, 1923, *Purpus 9204* (G). GUERRERO: Rio Balsas, 1910, *Orcutt 4162* (G); Iguala, 1905, *Pringle 13681* (G); Real de Guadelupe, 1898, *Langlassé 351* (G); Coyuca, 1934, *Hinton 6042* and *6640* (G); Anonas, 1936, *Hinton 9159* (G); Placeres, *Hinton 9079* (G); Manchon, 1937, *Hinton 10513* (G). MICHOACAN: Zitacuaro to Tiamara, 1938, *Hinton 13089* (G); Buena Vista to Tomatlan, 1938, *Hinton 12078* (G); Apatzingan, 1938, *Hinton 12054* and *12061* (G). MORELOS: Yautepec, 1903, *Rose & Painter 6596* and *8579* (G); Huajintlan, 1929, *Lyonnet 305* (G); Cuernavaca, *Pringle 7183* and *Rose 11054* (G). MEXICO: Vigas, 1932, *Hinton 1218* (G); Salitre, 1935, *Hinton 8181* (G). OAXACA: Guichocovi to Lagunas, 1895, *Nelson 2743* (G). EL SALVADOR: Acajutla, 1923, *Calderón 1673* (G).

In its more slender, more erect habit, pale abundantly strigose leaves, and smaller flowers, fruit and mature calyces, this attractive annual is very different in appearance from *H. fruticosum* L., of the West Indies, Yucatan and extreme northeastern Mexico. It deserves recognition as a species. The name *H. assurgens* is based upon *H. phyllostachyum* var. *erectum* Macbr. and so upon the collection made at Culican, Sinaloa, by Brandegee. Through the kindness of Mr. Standley, of the Field Museum, I have been able to study the Boraginaceae in the herbarium made in Mexico by Sesse & Mociño. These botanists collected *H. assurgens* and described it as *Anchusa incana*. The specimens in their herbarium have no geographic data but in their Flora Mexicana *Anchusa incana* is given as from Cuernavaca, Morelos.

Heliotropium (§ Orthostachys) **cremnogenum,** sp. nov.

Herba annua erecta 8–18 cm. alta; cauli 0.5–1 mm. crasso solitario infra medium simplici supra medium pauce fertiliterque ramoso sparse strigoso, internodiis saepe 1–2 (raro ad 3.5) cm. longis; foliis conspicuis sparsis alternis vel suboppositis superioribus paullo reductis; lamina ovato-oblonga vel lanceo-ovata submembranacea 2–4 cm. longa 8–17 mm. lata nervosa infra medium latiore, apice acuta, basi obtusa vel acuta in petiolum 3–5 mm. longum graciliter contracta, supra viridi in costa et nervis lateralibus sparse strigosa, subtus pallidiore strigosa, margine plana vel angustissime revoluta; inflorescentia racemiformi ebracteata vel medium versus folio grandi caulinis simili ornata, maturitate 3–10 cm. longa gracili laxiflora, internodiis 1–15 mm. longis; calyce sub anthesi elongato 2.5–3 mm. longo, lobis strictis inaequalibus lanceolatis 2–3 mm. longis, lobo longissimo apicem tubi corollae attingente; calyce

fructifero accrescente, lobis ascendentibus vel divergentibus ad 5 mm. longis; pedicellis 0.5–1 mm. longis; corolla 4 mm. longa inconspicua, lobis ad 1 mm. longis linearibus, sinibus latis obtusis saepe plicatis; tubo corollae imam ad basim et paullo sub apice angustissimo (ca. 0.5 mm. crasso) infra medium crassissimo ca. 0.8 mm. crasso, extus sparse strigoso, intus glaberrimo et ca. 0.3 mm. supra basim minute appendiculato; antheris ca. 0.5 mm. longis subsessilibus lanceo-ovoideis ad 1 mm. supra basim tubo corollae affixis, apicem versus attenuatis, supra medium puberulentis, apice non-cohaerentibus; ovario ca. 0.3 mm. alto glabro hemisphaerico vel subovoideo, stylo ca. 0.3 mm. longo coronato; stigmate elongato ca. 0.6 mm. longo (disco stigmatis quam basi appendiculae sterilis paullo crassiore), sub maturitate fructus ut videtur sessili; fructu 2.5–3 mm. lato ca. 1.2 mm. alto subquadrilobato; nuculis 4, dorso valde convexis reticulato-rugosis, pilis sparsis erectis curvatis ornatis, ventre angulatis utrisque faciebus impressionibus circularibus notatis.

MICHOACAN: on cliffs at Mal Paso, dist. Huetamo, Oct. 2, 1935, *Hinton 8514* (TYPE, Gray Herb.).

An extraordinarily distinct species differing widely in gross habit and technical fruiting and floral characters from all of its congeners known to me. In general aspect it is more suggestive of a small fruiting plant of *Spigelia Humboldtiana* C. & S. than it is of other species of *Heliotropium*. The minute tubular corolla with linear lobes separated by broad obtuse sinus, and its reticulate-rugose nutlets, are certainly unusual if not unique in the genus.

Heliotropium (§ Orthostachys) **Karwinskyi**, sp. nov.

Frutex 5–10 dm. altus laxe ramosissimus; ramulis gracilibus fragilibus saepe brevibus, internodiis 1–15 mm. longis; foliis numerosis alternis 3–5 cm. longis 1.5–3.5 mm. latis medium versus latioribus, utrinque gradatim attenuatis, basi cuneatis ca. 1 mm. longe petiolatis, supra obscure viridibus medio-sulcatis pilis appressis e basi pustulato erumpentibus plus minusve vestitis, subtus mediocostatis sed enervatis dense pallideque strigosis, margine anguste revolutis; cymulis racemosis gracillimis ramulos terminantibus pluribus (2–4) simplicibus vel dichotomis 1–4 cm. longis laxifloris minute (0.3–1 mm. longe) bracteatis; floribus fructiferis 1–8 mm. longe distantibus; floribus sub anthesi minutis ca. 1.7–2 mm. longis, 0–0.8 mm. longe pedicellatis, lobis calycis triangulari-ovatis subaequalibus haud imbricatis; corolla late cylindrica 1.5–2 mm. longa calycem paulo superante inconspicua, extus supra basim pallide strigosa, intus medium versus puberulenta, lobis perbrevibus rotundis ca.

0.3 mm. longis latioribus quam latis; antheris cuneato-sagittatis ad 0.5 mm. supra basim corollae affixis subsessilibus, apice acutis puberulentis haud cohaerentibus; ovario ovoideo-globoso ca. 0.6 mm. longo sub anthesi glabro; stylo cylindrico ca. 0.3 mm. longo; stigmate glabro crassiusculo disciformi quam columna styli subduplo latiore (2–3-plo latiore quam longo) appendicula elongata sterili destituto; fructu 2.5–3 mm. diametro depresso 1–1.4 mm. alto conspicue albo-hispido; nuculis 4 dorso convexis intus angulatis.

TAMAULIPAS: Cumbre de Santiaguillo, frutex 2–3 pedalis, in frigidiusculis, Dec. (?), 1842, *Karwinsky 646* (TYPE, Leningrad; frag. Gray Herb.).

This is an unusually distinct species and one for which I can suggest no very close relative. In gross aspect it most suggests *H. uninerve* Urban, but it is certainly not closely related to that Haitian plant. The very small broadly cylindrical corolla with poorly developed broad erect or incurved lobes, the short thick discoid stigma devoid of a well developed sterile appendage, the free narrowly sagittate anthers, the very slender inconspicuously bracted inflorescence, etc., set *H. Karwinskyi* off from all known species. The type was collected about 50 km. southwest of Victoria in western Tamaulipas.

Heliotropium Genovefae, sp. nov.

Planta fruticulosa; caulibus pluribus fistulosis laxe sparseque ramosis 3–5 dm. longis 2–3 mm. crassis fuscis subvelutinis (villosulis et plus minusve glanduliferis) internodiis 1–6 cm. longis; foliis conspicuis pilis brevibus erectis e basi bulbosa erumpentibus dense obsitis, in nervis villosulis; lamina folii ovato-lanceolata vel oblongo-lanceolata 5–11 cm. longa 2.5–5 cm. lata, apice acuta, basi obtusa, infra medium latiore deinde in petiolum 1–2 cm. longum gracilem abrupte contracta, subtus pallidiore costa et nervis pinnatis (ca. 6-jugis) evidenter notatis; cymis scorpioideis terminalibus solitariis vel geminatis densifloribus ebracteatis, maturitate 2–6 cm. longis 1–4 cm. longe pedunculatis; calyce sub anthesi 2–2.2 mm. longo sessili basim versus in lobos oblongo-lanceolatos 0.3–0.4 mm. latos apice acutos diviso; corolla purpurascente ad 7 mm. longa extus villosa intus glaberrima, limbo ad 6 mm. diametro, tubo 4–5 mm. longo e parte basali 2 mm. longa et 1 mm. crassa sursum ampliato apicem versus 2 mm. crasso, lobis rotundis 2 mm. longis et 2.5–3 mm. latis; antheris elongatis lineari-oblongis 2 mm. longis apice inconspicue apiculatis glabris haud cohaerentibus ad 2 mm. supra basim tubi corollae affixis; ovario sub anthesi glabro ca. 0.6 crasso et alto; stylo ca. 0.4 mm. longo in stigma breve ca. 0.3 mm. crassum et 0.1–0.2 mm. altum

abrupte expanso: fructu ellipsoideo-ovoideo 3–4 mm. longo 2–2.7 mm. crasso infra medium crassiore velutino plus minusve glandulifero fusco, maturitate in nuculas 2 biloculares biovulatas disrupto, stylo ut videtur sessili coronato.

HAITI: vicinity of Port à L'Ecu, low thickets on coastal plateau east of bay; fl. purplish, March 15–17, 1929, *Emery C. & Genevieve M. Leonard 13851* (TYPE, U. S. Nat. Herb. no. 1,452,440; ISOTYPE, Gray Herb.).

This is apparently a member of the section COCHRANEA and is the first one to be described from the West Indies. In the structure of its nutlets it agrees with *H. molle* (Torr.) Johnst. of the desert plateau of northern Mexico and adjacent Texas and is probably most closely related to that species. Its more slender loosely branched habit, slenderly petiolate, more elongate, non-crisped leaves and smaller corollas quickly distinguish it from the Mexican plant. In habit it suggests the other Mexican member of the section COCHRANEA, *H. macrostachyum* (DC.) Hemsl., but that plant has one or more infertile cavities supplementing the two seminiferous cells present in each nutlet. The species is named in honor of Mrs. Leonard who discovered the plant while collecting with her husband in Haiti.

Coldenia canescens DC., var. **pulchella** var. nov.

Planta a varietate typica differt corolla duplo majore 9–12 mm. longa, limbo 5–8 mm. diametro.

ARIZONA (Yuma County): Kofa Mts., 1700 ft., March 24, 1933, *Shreve 6257* (TYPE, Gray Herb.); Castle Dome, Sept. 17, 1929, *Jones 25015* (G); rocky hillside near Stone Cabin on Dome-Quartzite road (north end of Castle Dome Mts.), March 23, 1933, *Wiggins 6616* (G). CALIFORNIA (Imperial Co.): Mesquite Station (west base of Chocolate Mts.), March 25, 1881, *Parish 755* (G); prostrate in dry stony soil at head of wash to 4-S Ranch, northeast of Ogilby, Chocolate Mts., April 6, 1932, *Munz & Hitchcock 12181* (G); 4-S Pass, Chocolate Mts., a few rods west of pass in rough rocky terrain, a low compact shrub about 4 inches tall, April 16, 1935, *Peirson* (G).

This variety is known only in extreme southwestern Arizona and, across the Colorado River, in adjacent California. This area includes some of the hottest and most arid desert in the United States. The var. *pulchella* not only has the corollas larger than in the typical variety, but has them also more intensely colored. The fruit, which is entirely glabrous, is indistinguishable from that of *C. canescens*.

Plagiobothrys californicus Greene, var. **fulvescens** Johnston, Contr. Gray Herb. **68**: 74 (1923).

Plagiobothrys micranthus Nelson, Am. Jour. Bot. **25**: 115 (1938).

ARIZONA: moist creek bank, Prescott, April 28, 1925, *Nelson 10232* (TYPE of *P. micranthus,* Laramie); White House Canyon, below recreation area, Santa Rita Mts., fl. white, about 4500 ft., April 14, 1928, *Graham 3538* (G); Soldiers Canyon trail below Vails Corral, Santa Catalina Mts., fl. white, April 12, 1928, *Graham 3462* (G).

I have had the privilege of examining the type of *P. micranthus* Nels. and find it conspecific with the two above cited collections made by Graham. All three collections are thoroughly typical of *P. californicus* var. *fulvescens,* a form characteristic of the western borders of the Colorado and Mohave deserts and heretofore unreported from Arizona. In gross aspect *P. californicus* var. *fulvescens* is very similar to the relatively common Arizonan *P. Pringlei* Greene. It differs from this latter species in its unstalked, distinct nutlets and in its slightly less elongate calyx. I suspect that *P. californicus* var. *fulvescens* may be more common in Arizona than the few collections at hand seem to indicate. Perhaps collectors, mistaking it for *P. Pringlei,* have failed to collect it.

Plagiobothrys infectivus, sp. nov.

Herba annua e radice gracili palari purpureo-tincta oriens; caulibus saltem basim versus purpureo-tinctis erectis vel ascendentibus solitariis vel pluribus 1–3.5 dm. longis ramos ascendentis saepe 1–2 gerentibus cum pilis gracilibus subappressis et pilis rigidioribus erectis villoso-hispidis; foliis infimis plus minusve congestis sed vix rosulatis sub anthesi subdeciduis; foliis caulinis oblongis vel oblongo-linearibus sessilibus 4–10 mm. latis 1.5–6 cm. longis, apice obtusis vel subrotundis, basi obtusis vel attenuatis, supra villosis, subtus pallidioribus pilis sparsioribus aliquantum rigidioribus ornatis, margine et costa purpureo-tinctis; inflorescentia conspicue foliaceo-bracteata saepe solitaria elongata saepe 1–2 dm. longa; floribus extra-axillaribus; corolla alba 4–4.5 mm. longa, limbo ca. 2.5 mm. diametro, lobis ovatis ca. 0.8 mm. latis ascendentibus; calyce sub anthesi extus brunneo-hispidulo, intus albido-villoso, fere ad basim lobato, lobis lineari-lanceolatis; calyce fructifero ca. 4 mm. crasso 1–2 mm. longe pedicellato, lobis lanceolatis 4–5 mm. longis suberectis; nuculis 4 late compresseque ovoideis 2.5–3.5 mm. longis nuculis *P. fulvi* similibus.

CALIFORNIA: "San Luis Obispo and Monterey counties," 1899, *Jared 28* (G); Lower Hospital Canyon, San Joaquin Co., April 1938, *Hoover 3067* (TYPE, Gray Herb.); lower end of Corral Hollow, San Joaquin Co.,

April 1937, *Hoover 1744* (G); 2 mi. east of Midway, San Joaquin Co., March 1932, *Mason 6829* (G); near Madison, Yolo Co., April 1902, *Heller & Brown* (G); Colusa County, May 1884, *Curran* (G).

This plant has the calyx, corolla, and fruit of *P. fulvus* var. *campestris*, and the type of inflorescence and growth-habit of *P. canescens*. The base of the stem, the root, the midrib and margins of the leaves, and commonly even the calyx-margins, are charged with abundant purple dye. In *P. fulvus* of Chile, and in the coarser but otherwise similar Californian var. *campestris*, the stems spring from a rather well developed and persistent basal leaf-rosette and produce, usually forked, definite scorpioid cymes which are devoid of bracts or rarely produce only one or two near their base. The basal rosette in *P. infectivus* is poorly developed and short lived. The inflorescence is not well differentiated from the leafy stem, as is the case in *P. fulvus*. The flowers are produced along elongate branches with numerous interspersed leafy bracts and accordingly seem to be scattered along leafy stems. This type of inflorescence is exactly that of *P. canescens*. The gross habit of *P. infectivus* and *P. canescens* is very similar. The deeply lobed calyx and the nutlet with an annulate scar, however, quickly distinguish *P. infectivus* from that species.

Plagiobothrys myosotoides (Lehm.) Brand, Pflanzenr. [Heft 97] IV. **252**[2]: 108 (1931).

Lithospermum myosotoides Lehm. Asperif. 319 (1818).
Lithospermum tinctorium R. & P. Fl. Peruv. 4. tab. 114 (1799); not Linn. (1753).
Plagiobothrys tinctorius Gray, Proc. Am. Acad. **20**: 283 (1885); Johnston, Contr. Gray Herb. **78**: 80 (1927).

California: ridge between Isabel Valley and Arroyo Bayo, Mt. Hamilton Range, Santa Clara Co., in loose shale under dense chaparral, 2500 ft., April 28, 1935, *C. W. & H. K. Sharsmith 1893* (G); Big Sandy Valley, east base of Black Mt., Fresno Co., May 17, 1938, *R. F. Hoover 3465* (G).

The two Californian collections above cited have been compared with a large series of *P. myosotoides* from South America and agree so closely with the austral material, in all technical details and intangibles of habit, etc., that I am confident that they must represent that species, heretofore unreported from North America. In South America typical *P. myosotoides* ranges in Chile from the prov. of Bio Bio north to Coquimbo (lat. 30°–38°), usually well below 5000 ft. alt. It reappears further north, and naturally at higher altitudes (10–15000 ft.) in middle-western and southern Peru and adjacent Bolivia (lat. 11°–17°). The two Cali-

fornian stations, one in the South Coast Ranges about 8 miles east of Mt. Hamilton Observatory, and the other in the Sierran foothills, 20–25 miles northeast of Fresno, are in areas which have been given a careful botanical exploration only recently. Neither are areas in which a recently introduced plant from Chile might be expected to appear. I am forced to the opinion that *P. myosotoides* is a native of California, but rare, local and only recently detected. It is another addition to the list of Californian borages which have an immediate close relative in Chile and Argentina or which divide their range between California and in these South American countries; e.g., *Coldenia Nuttallii, Cryptantha circumscissa, Plag. fulvus* var. *campestris* (var. *typica* in Chile), *Plag. acanthocarpus* (*P. gracilis* in Chile), *Plag. californicus* (*P. collinus* in Chile), *Pectocarya pusilla, Pectocarya linearis* var. *ferocula, Amsinckia tessellata,* etc.

Among the Californian species *P. myosotoides* is most closely related to *P. Torreyi* Gray. It is a more slender and erect plant with slightly smaller fruit and much more roughened nutlets. The nutlets of *P. Torreyi* have the back marked by broad smooth low-convex transverse ridges which are usually separated by parallel lineate grooves. In *P. myosotoides* the back of the nutlet is usually roughened by narrow crests and papillae, and the ridges are more irregular and usually separated by broad irregular interspaces. Both species have the herbage charged with a purple dye. *Plagiobothrys Torreyi* is a montane plant, of the Yellow Pine Belt. *Plagiobothrys myosotoides,* in California, comes from much lower altitudes in the chaparral. The two species are certainly closely related. Typical *P. myosotoides* differs from *P. Torreyi* in habit, but *P. verrucosus* of Patagonia (which perhaps may be no more than a variety of *P. myosotoides*) has exactly the habit of *P. Torreyi* and its var. *diffusus,* and has less roughened nutlets than *P. myosotoides* though these never become as smooth and as regularly marked as in the Californian *P. Torreyi.* In this group of species exact definition of species has become difficult.

The group connects with *P. tenellus* (Nutt) Gray through *P. shastensis* Greene. The basal constriction of the nutlet, producing the characteristic cruciform nutlets of *P. tenellus,* is usually present in *P. shastensis,* but it is usually less pronounced and may rarely be almost absent. The herbage varies in the amount of purple dye present. It is one of the dye-stained forms of *P. shastensis,* having weakly constricted nutlets, which was described as *P. Torreyi* var. *perplexans* Johnston. This latter variety had best go into the synonymy of *P. shastensis.*

Mention should be made of an unnamed plant immediately related to

P. myosotoides, which was recently collected by John Thomas Howell at The Pinacles, San Benito Co., 1937, no. 12905, and at Santa Lucia Camp, Santa Lucia Mts., Monterey Co., 1936, no. 2416. These are plants having the dye-stained herbage, the slender branching habit, and the nutlets of *P. myosotoides.* In fact they differ only by having the calyx armed with uncinate bristles. The collections came from opposite sides of the Salinas Valley. The uncinate hairs are not developed in the South American forms of *P. myosotoides* and, furthermore, are probably unique in the genus. Consequently this plant, otherwise similar to *P. myosotoides,* can not be an introduction from South America, and if it is native to California I can not see why the collections of *P. myosotoides* from Santa Clara and Fresno counties can not be accepted as native also.

Cryptantha dissita, sp. nov.

Herba annua erecta 5–25 cm. alta; caulibus simplicibus vel non raro medium versus ramulos ascendentes breves 1–2 gerentibus, villoso-hispidis, pilis gracilibus haud pungentibus 0.5–1 mm. longis erectis et appressis; foliis oblongis ligulatis vel lineari-oblongis 6–20 mm. longis 2–3 mm. latis utrinque villoso-hispidis, supremis paullo reductis, infimis subcongestis, reliquis 3–15 mm. distantibus; pilis folii 1–1.5 mm. longis gracilibus saepe curvatis griseis haud abundantibus erectis vel ascendentibus e basi subbulbosa orientibus; cymis ternatis ebracteatis pedunculum nudum 1–6 cm. longum terminantibus 3–10 cm. longis; floribus numerosis, maturitate 5–15 mm. distantibus; corolla alba, limbo 4–6 mm. diametro, tubo (in sicco brunneo) ca. 2 mm. longo, lobis calycis floriferi aequilongo; calycibus fructiferis 5–6 mm. longis basim versus 2–2.5 mm. crassis, lobis supra nuculis conniventibus deinde erectis vel ascendentibus, costa incrassata pilis 1–2.5 mm. longis rigidis pungentibus 5–10 e basi bulbosa orientibus armata, alibi praesertim marginem versus loborum villosis (pilis 0.5–1 mm. longis adpressis); ovulis 4; nuculis 1–4 (saepe 2–4), abaxialari semper maturante, 2–2.5 mm. longis laevibus nitidis maculatis 2.5-plo longioribus quam latis, dorso convexis, latere rotundis, ventre subplanis vel late obtusis, sulco omnino clauso imam ad basim late furcato; gynobasi ca. 1 mm. longo; stylo apicem nuculi distincte attingente vel breviter sed distincte superante.

California (Lake County): hills about Scotts Valley, 6 mi. northwest of Lakeport, May 30, 1902, *J. P. Tracy 1744* (G); near foot of grade west of Lakeport, May 1, 1938, *M. S. Baker 8956* (type, Gray Herb.); on Hopland highway a few miles west of Lakeport, May 5, 1934, *M. S. Baker 7648* (G); near Lakeport, May 1, 1930, *M. S. Baker 4939* (G).

The three collections by M. S. Baker, above cited, came from a single locality where the plant is locally very common on a tuffaceous outcrop of about an acre in extent. Growing with this *Cryptantha,* and also confined to this outcrop, are a number of plants with disrupted ranges along the inner Coast Ranges. The *Cryptantha* is evidently related to that variable plant of west-central California, south of San Francisco Bay, which I have called *C. hispidissima* Greene. It differs in its erect sparingly branched stems, its subequal leaves which tend to be congested below, its conspicuous corollas, and its well formed naked terminal ternate cymes which are projected above the leaves on a naked peduncle. This proposed species is obviously an outlying relative of *C. hispidissima,* local in a special habitat over a hundred miles north of the range of that more southern species.

Cryptantha hispidula Greene ex Baker, West Amer. P. **2:** 10 (1903), nomen; Brand, Pflanzenr. [Heft 97] IV. **252**[2]**:** 60 (1931).

CALIFORNIA. Napa Co.: Knoxville, colonies on rocky slopes, May 8, 1903, *C. F. Baker 2966* (G, ISOTYPE); about 2 mi. north of Knoxville on road to Lower Lake, April 1936, *M. S. Baker 8172;* Pope Creek, on serpentine hill on road near Pope Valley, April 1937, *M. S. Baker 7816;* Pope Valley road near Pope Valley, 1936, *M. S. Baker 8758* (G); serpentine east of Pope Valley along road to Monticello, April 1938, *M. S. Baker 8939.* Colusa Co.: serpentine hill along Highway no. 20 (Clearlake to Williams), May 17, 1937, *M. S. Baker 8656* (G). Sonoma Co.: near entrance to Sulphur Creek Canyon near highway, 1934 and 1936, *M. S. Baker 7775* and *8608* (G). Lake Co.: Binkley Ranch, between Cobb Mt. and Adams Springs, June 25, 1933, *Jussel* (G); serpentine hill a few miles east of Middletown, along highway, 1935, *M. S. Baker 8128;* dry slope of lava-gravel, 3 mi. north of Middletown on road to Lower Lake, May 1935, *Clausen 1035* (G); a mile east of Lower Lake near highway, April 1934, *M. S. Baker 7764* (G); summit of ridge west of Leesville, Colusa Co., in gravel among chaparral, 2000 ft., May 1919, *Heller 13124* (G).

The name *Cryptantha hispidula* Greene was first published in a list of exsiccatae distributed by C. F. Baker and subsequently appeared on the printed specimen-label associated with his no. 2966 which had been collected near Knoxville, Napa County. Greene never published a description of this species. Brand, finding the unpublished name on Baker's specimen at Berlin, adopted the name and described three varieties of this species, namely, the var. *eu-hispidula* (including *Baker 2966* from Napa Co. and *Elmer 3936* and *Eastwood 67a* from Santa Barbara Co.),

the var. *Elmeri* (from Washington and Oregon), and finally the var. *Abramsii* (based upon *C. Abramsii* Johnst. from near San Pedro, Los Angeles Co.). I have accepted *Baker 2966* as the obvious type of *Cryptantha hispidula* Greene ex Brand. The collections from Santa Barbara are *C. Clevelandii* var. *florosa* Johnst. The specimens cited under the var. *Elmeri* Brand, represent forms of *C. Hendersonii* (Nels.) Piper having a single polished nutlet. The var. *Abramsii* is a synonym of *C. Clevelandii* Greene.

The species, *C. hispidula,* replaces *C. Clevelandii* Greene and *C. hispidissima* Greene in the North Coast Ranges. These two relatives of *C. hispidula* are known only from the region south of San Francisco Bay. From them *C. hispidula* differs in its short style, which never reaches to the tip of the nutlets, in the very short inconspicuous hairs of the stem, which are never distinctly bristly, and in the consistently dimerous or trimerous slender elongate cymes. The species seems to be a plant of serpentine. Dr. Milo S. Baker writes me, "regarding the influence of serpentine on the borage flora of the North Bay counties. I know of only two species that seem to have a definite serpentine habitat. These are *C. hispidula* and *Allocarya tenera.* In Lake and Napa counties one may confidently expect to find *C. hispidula* somewhere on a serpentine outcrop. As for *A. tenera* I have collected it only in two localities and both of these are serpentine."

Cryptantha spithamaea, sp. nov.

Herba annua erecta 5–20 cm. alta; ramis numerosis ascendentibus saepe simplicibus 1–2 mm. crassis plus minusve brunnescentibus cum pilis 0.4–1 mm. longis plerumque appressis haud abundanter vestitis; foliis firmiusculis lineari-oblanceolatis vel linearibus 5–15 mm. longis 1–3 mm. latis, utrinque pilis saepe e pustulis orientibus appressis haud abundantibus vestitis, inferioribus oppositis mox deciduis majoribus 1–10 mm. distantibus, superioribus quam inferioribus dimidio minoribus saepe angustioribus; cymulis scorpioideis 3–6 cm. longis geminatis ebracteatis 1–2 cm. longe pedunculatis vel solitariis, floribus inferioribus bracteatis; floribus ut videtur uniseriatis, superioribus congestis, inferioribus non raro ad 1 cm. distantibus; corolla alba, limbo 1.5–2 mm. diametro, tubo ca. 2 mm. longo lobis calycis aequilongo; calycibus fructiferis strictis vel stricte ascendentibus 3–5 mm. longis, lobis linearibus quam nuculis saepe duplo longioribus, in costa pilis rigidis curvatis vel sinuosis armatis alibi pilis gracilibus mollibus appressis vestitis, apice erectis vel maturitate plus minusve divergentibus; ovulis 4, abaxiali semper maturante; nuculis 1 vel rariter 2 lanceoideis 2–2.5 mm. longis

laevibus nitidis, basi truncatis, apice acuminatis, dorso convexis, ventre obtusis, sulco clauso imam ad basim in areolam triangularem aperto; gynobasi ca. 1.5 mm. alto; stylo ca. 0.5 mm. longo, ad 0.5 mm. infra apicem nuculae attingente.

CALIFORNIA. Mariposa Co.: 3 mi. northwest of Coulterville, locally quite abundant on serpentine, May 16, 1937, *R. F. Hoover 2169* (TYPE, Gray Herb.); 2 mi. northwest of Coulterville, May 9, 1938, *Hoover 3394* (G). Tuolumne Co.: near Moccasin Creek near power-house, May 9, 1938, *Hoover 3388* (G); 3 mi. south of Chinese Camp, May 9, 1938, *Hoover 3380* (G).

This species is a member of the Leiocarpae and is probably most closely related to *C. hispidula* Greene of the serpentine areas of the inner North Coast Ranges. It is the only member of its group known from the Sierran foothills. From *C. hispidula* it differs in its solitary or geminate spikes and more elongate calyx-lobes. The plants are smaller and more abundantly and strictly branched.

Cryptantha Ganderi, sp. nov.

Herba annua e basi ramosa 1–4 dm. alta; ramis dichotome ramosis pilis saepe 1–2 mm. longis divaricatis munitis; foliis elongatis angustis 2–5 cm. longis 2–3 mm. latis, apicem versus aliquantum attenuatis, apice saepe obtusis, utrinque hispidis; pilis 1–2 mm. longis ascendentibus vel erectis saepe e basi pustulato-bulbosa orientibus; cymis scorpioideis solitariis terminalibus vel ex axillis foliorum caulinorum superiorum orientibus ebracteatis 5–15 cm. longis maturitate laxifloris; corolla alba inconspicua 2.5 mm. longa; calycibus subsessilibus sub anthesi 2–5 mm. longis mox accrescentibus fructiferis 6–10 mm. longis; lobis maturitate linearibus rigidis costatis, infra medium conspicue (2.5 mm. longe) flavescenteque hispidis, supra nuculis conniventibus deinde erectis vel divergentibus; ovulis 4, saepissime 3 abortis; nuculis laevibus vel obscurissime et sparsissime subrugulosis nitidis plus minusve maculatis solitariis vel raro duobus lanceoideis acuminatis 1.5–2 mm. longis, dorso convexis, margine rotundis, ventre late obtusis vel rotundis, sulco clauso basim versus saepe in areolam triangularem parvam apertam furcato; gynobasi 1–1.5 mm. longo; stylo ca. 0.5 mm. longo ad 0.8–1 mm. infra apicem nuculae attingente.

CALIFORNIA: near school at Borego Valley, Larrea-Franseria association, 500 ft. alt., April 15, 1938, *Frank Gander 5328* (TYPE, Gray Herb.); Borego Spring, San Diego County, April 9, 1932, *Epling & Robinson* (G). BAJA CALIFORNIA: sandy wash 23 miles east of Pozo Aleman on road to Barril, March 3, 1935, *Wiggins 7844* (G). SONORA:

22 miles south of Sonoyta on road to Punta Peñasco, semistabilized dunes with *Abronia*, March 14, 1936, *Keck 4163* (G).

A desert relative of the characteristically coastal *C. Clevelandii*. It is readily distinguished by its larger nutlets, much accrescent calyx, and very slender elongate calyx-lobes. The abaxial nutlet is always developed and is usually twice the length of the gynobase. The style reaches up to only 2/3 to 3/5 the height of the nutlet.

Cryptantha Wigginsii, sp. nov.

Herba annua laxe ascendenter ramosa 1–2 dm. alta; caulibus 1–2 mm. crassis, pilis 0.5–1 mm. longis saepe appressis falcatis inconspicue sparseque vestitis; foliis 1–4 cm. longis 1.8–4 mm. latis linearibus vel linearioblongis, pilis appressis rectis utrinque vestitis, apice obtusis; cymulis scorpioideis simplicibus bracteis foliaceis 1–2 ornatis densifloris 1–3 mm. longe pedunculatis; calycibus subsessilibus fructiferis ca. 4 mm. longis, lobis costatis infra medium ca. 0.7 mm. latis apicem obtusum versus 0.3 mm. latis, in costa pilos e basi bulboso-pustulata orientes rigidos divaricatos 1–2 mm. longos gerentibus, alibi pilos gracillimos appressos gerentibus; corolla alba, tubo ca. 2 mm. longo 1 mm. crasso lobis calycis subaequilongo, limbo 3–3.5 mm. diametro; nuculis 1–4 ca. 2.1 mm. longis 0.9 mm. latis homomorphis (nucula abaxiali subpersistente) cinereis plus minusve maculatis, basi truncatis, apice acutis, margine infra medium acutis et supra medium rotundis, dorse convexis supra medium dense verrucosis vel congeste sinuateque rugulosis subopacis et infra medium laevibus nitidis, ventre apicem versus verrucosis alibi laevibus et nitidis; sulco clauso imam ad basim abrupte furcato; gynobasi 1.3 mm. longo; stylo ca. 0.4 mm. longo ca. 0.2 mm. infra apicem nuculae attingente.

Baja California: Rancho Cuevas, 18 mi. south of Tia Juana, gentle slope along ocean, very rocky red-clay soil, April 2, 1931, *Ira L. Wiggins 5107* (type, Gray Herb.).

This is probably a relative of *C. Clevelandii* Greene but is readily distinguished from that species and allies by its roughened nutlets. Below the middle the back of the nutlet is smooth lustrous and somewhat mottled. Above the middle the back is roughened by minute wart-like tuberculations or by low sinuous ridges resulting from the confluence of the warts. There are 4 ovules and all frequently mature into nutlets. The abaxial nutlet is always present. The scorpioid cymes are solitary or rarely geminate and are always leafy bracted towards the base.

Cryptantha Clokeyi, sp. nov.

Herba annua 10–15 cm. alta erecta; caulibus solitariis praesertim

medium versus longe ascendenter ramosis, pilos 0.5–1.3 mm. longos graciles rigidiusculos caulis basim versus erectos alibi appressos gerentibus; foliis lineari-lanceolatis crassiusculis infimis plus minusve congestis 2–3 cm. longis 2 mm. latis, supremis conspicue reductis, medianis 1–3 cm. distantibus, faciebus laminae pilos 0.7–1.5 mm. longos erectos vel appressos saepe (praesertim faciebus superioribus) e pustulis manifestis erumpentes gerentibus; cymis 3–6 cm. longis solitariis vel geminatis, floribus perspicue uniseriatis inferioribus ad 5–9 mm. distantibus, infimis bracteis subulatis 5–10 mm. longis oppositis; corolla alba, limbo (lobis ascendentibus) 2 mm. diametro, tubo ca. 2 mm. longo quam lobis calycis linearibus 0.5–1 mm. brevioribus; calycibus fructiferis 7–10 mm. longis 1–2 mm. longe pedicellatis; lobis lanceolatis longe attenuatis quam nuculis 2–3-plo longioribus (basim versus usque ad 2 mm. latis, supra medium minus quam 0.6 mm. latis) supra nuculos conniventibus deinde erectis vel curvato-ascendentibus, plus minusve costatis in costa pilis gracilibus 2–3 mm. longis ornatis reliquo pilis numerosis adpressis praesertim marginem versus villosis; nuculis 4 aequalibus triangulari-ovatis ca. 2 mm. latis et 3 mm. longis minute granulatis et conspicue papillatis vel tuberculatis, apice acutis, basi truncatis, dorso convexis, margine angulatis vix incrassatis, ventre obtusis; sulco clauso vel aperto basim versus late furcato; gynobasi apicem nucularum vix attingente; stylo nuculas evidenter superante.

CALIFORNIA: north of Barstow, San Bernardino Co., 2800 ft., April 25, 1935, *I. W. Clokey & E. Ganderson 6859* (TYPE, Gray Herb.).

A very distinct species belonging to the Muricatae and perhaps most closely related to *C. Hooveri* Johnst. of the Sierran foothills of central California. The new species differs in its much coarser habit, elongate cymes of much larger flowers, broad leaves, larger and more elongate nutlets, and protruding style. The gross habit of *C. Clokeyi* suggests a very coarse form of *C. nevadensis* var. *rigida* Johnst. The coarse broad nutlets of *C. Clokeyi*, however, are very different from the slender attenuate nutlets of *C. nevadensis*. The discovery of this unusually distinct new species in the middle Mohave Desert is most unexpected. The plant is probably rare and local since Mr. Clokey has failed to rediscover it along the road north of Barstow where he originally found it.

Cryptantha fastigiata, sp. nov.

Planta herbacea vel suffruticosa annua vel saepissime subpersistens 1–10 dm. alta; caulibus erectis vel ascendentibus solitariis vel pluribus abundanter ascendenterque ramosis, pilis antrorse valdeque appressis 0.5–1 mm. longis et pilis sparsioribus erectis rigidis 1–2 mm. longis e

basi pustulata erumpentibus vestitis; caulibus vetustis basim versus non raro plus minusve duris et lignosis ad 8 mm. crassis; foliis numerosis anguste oblanceolatis vel lineari-oblanceolatis caulis apicem versus gradatim reductis, inferioribus 3–10 mm. latis 4–6.5 mm. longis, supra medium latioribus, basim versus in petiolum 1–10 cm. longum gradatim attenuatis, apice acutis, utrinque sparse hirsutis (pilis 1–1.5 mm. longis e basi plus minusve conspicue pustulata erumpentibus), subtus prominenter mediocostatis sed enervatis; cymis unilateralibus scorpioideis solitariis vel geminatis laxifloris sparse minuteque bracteatis; corolla alba, tubo ca. 1 mm. longo quam lobis calycis tertia parte breviore, limbo 3–4 mm. diametro; calyce fructifero 3 mm. longo 1–2 mm. longe pedicellato, lobis infra medium costatis lineari-oblongis pilos rectos rigidos erectos 1–1.5 mm. longos et pilos 0.5 mm. longos appressos gerentibus haud villosis; ovulis 4; nuculis heteromorphis triangulari-ovatis nigris tuberculis et margine pallidis ornatis compressis, dorso convexis, ventre late obtusis; sulco apicem versus nuculae angustato, infra medium nuculae in areolam conspicuam expanso; nucula abaxialari maxima persistente majore 1.5–1.9 mm. longa; nuculis 3 consimilibus 1–1.5 mm. longis; gynobasi elongato ca. 1 mm. longo; stylo rigido nuculas maximas 0.5–1 mm. longe superante.

Baja California: Puerto Refugio, Angel de la Guardia Island, 1921, *Johnston 3374* (G); Las Animas Bay, 1921, *Johnston 3505* (type, Gray Herb.); San Esteban Island, 1921, *Johnston 3175* (G); South San Lorenzo Island, 1921, *Johnston 4192* (G); 5–6 m. west of Barril, March 1935, *Wiggins 7828* and *Shreve 6992* (G); 40 mi. east of San Ignacio, March 1935, *Shreve 7055* (G); Santa Rosalia, 1889 and 1938, *Palmer 188* and *Gentry 3779* (G); San Marcos Island, 1921, *Johnston 3621* (G); Carmen Island, 1890 and 1931, *Palmer 846* and *Collins, Kearney & Kempton 238* (G).

This species ranges in the middle third of the peninsula of Baja California and on the adjacent islands in the Gulf of California. It has passed as a form of *C. racemosa* (Wats.) Greene and was so treated in my monograph of the genus, Contr. Gray Herb. **74:** 32–3 (1925), and in my report on the flora of the islands in the Gulf of California, Proc. Calif. Acad., ser. 4, **12:** 1147 (1924). Notes on the habit of the plant may be found in the latter report. This plant is most certainly not a form of *C. racemosa!* That latter species has a very different range. From the northernmost part of Baja California *C. racemosa* extends through the hottest and driest parts of the Colorado and Mohave deserts in eastern California, western Arizona and southern Nevada. It becomes a loosely and repeatedly much branched small bush and bears its slenderly long-

pedicellate flowers in a unique type of loose sympodium that is very much more racemose than scorpioid. The well developed biseriate scorpioid cymes, the shorter pedicels, and the long fastigiate stems quickly distinguish *C. fastigiata* from *C. racemosa*. In habit and in most details *C. fastigiata* is very similar to *C. holoptera* (Gray) Macbr., but that latter has larger, very broadly winged, homomorphic nutlets. The closest relative of *C. fastigiata* is *C. inaequalis* Johnst., of southernmost Nevada and adjacent California. In all details, save range and growth-form, it is remarkably similar to *C. fastigiata*. However, *C. inaequalis* is a slender herbaceous annual 1–3 dm. tall with the stems proportionately better branched. The young stems in the inflorescence are clothed with very slender, 0.5–1 mm. long, loosely appressed hairs. In the peninsular species the younger parts of the stem are covered with coarser shorter closely appressed hairs and the hairs are more conspicuously encrusted and hence duller than in *C. inaequalis*.

Cryptantha Rattani Greene, Pittonia **1**: 760 (1888).

CALIFORNIA (Monterey Co.): along the Carmel River 20 mi. southeast of Carmel, July 1929, *Wolf 3772* (G); right bank of the Carmel River 3 mi. above the Mission, April 1903, *Heller 6587* (G); Soledad, May 1881, *Congdon 72* (G); "Monterey County," 1887, *Hickman* (TYPE, Herb. Greene).

When he published *C. Rattani*, Greene stated that he had received his first material of the species from Rattan, who thought it was undescribed. This material came from near San Jose and Greene then considered it "a state of the common *C. flaccida* with larger corollas and more spreading habit, for the specimens were young and only beginning to flower." Subsequently Hickman sent Greene "a plant in good fruit" which revealed the characters of the species. There is no collection from Rattan, labeled "*C. Rattani*," in the Greene Herbarium at Notre Dame University, though the Hickman plant, so labeled, is preserved there. I suspect that Rattan's immature specimens were not preserved by Greene and that his identification of the Rattan and Hickman collections was based on his recollection of the former. In any case the description of *C. Rattani* was based upon the fruiting plants supplied by Hickman and, despite the name of the species, the Hickman plant from Monterey County must be taken as type. The few specimens of this interesting species, at hand, all come from the country just inland from Monterey, California, and suggest that it may be endemic in that area. Perhaps after all Rattan's plant from San Jose may not have been conspecific with the plant of Hickman. The species has the gross aspect of a plant of

C. hispidissima Greene but has tuberculate nutlets, and well developed corollas indicating its affinities with *C. intermedia* (Gray) Greene. West of the Coast Ranges, *C. intermedia* or its relatives is not known between San Luis Obispo County and San Francisco Bay. This local relative of *C. intermedia* in the Monterey area is of some interest and it is hoped that collectors will watch for it when working in the region.

Cryptantha pterocarya (Torr.) Greene var. **stenoloba**, var. nov.

A forma typica speciei differt lobis calycis fructiferi conspicue elongatis lanceolatis 5–8 mm. longis ca. 1 mm. latis quam nuculis 1.5–2.5-plo longioribus.

ARIZONA: between Mesquite and Littlefield, Mohave Co., 1500 ft. alt., April 17, 1937, *Kearney & Peebles 13184* (G); near Arizona-Nevada line, sandy desert, April 4, 1934, *Maguire 4972* (G). NEVADA: 15 mi. east of Glendale, Clark Co., 4000 ft., May 19, 1933, *Maguire & Blood 4466* (TYPE, Gray Herb.).

A plant of the valley of the lower Virgin River in Nevada and adjacent Arizona where it appears to replace the ordinary form of the species. It has the one wingless and the three broadly winged nutlets of typical *C. pterocarya,* but differs conspicuously in its very elongate narrower calyx-lobes.

Cryptantha Grahamii Johnston, Jour. Arnold Arb. 18: 231 (1937).

UTAH: shale hillside near Willow Creek, 22 mi. south of Ouray, 5500 ft. alt., June 16, 1937, *R. C. Rollins 1716* (G); very dry knoll, east slope of Big Pack Mt., 4 mi. west of Willow Creek, 6000 ft., stems one to few, June 15, 1937, *Rollins 1707* (G).

This remarkable species was described from flowering material, but now, thanks to Mr. Rollins, I can supply a description of the fruit from new material obtained at the type locality. The species keys out in Payson's monograph to *C. sobolifera* Payson, *C. aperta* Payson or *C. Sheldonii* Payson, but it is not related closely to any of these. The species is truly a very distinct one.

Fruit ovoid, the coarse style surpassing it by about 2 mm.; nutlets 4, oblong-lanceolate, 3.5–4 mm. long, 1.8–2 mm. wide, margins touching, knife-like, both faces of nutlets with inconspicuous small low rounded tuberculations, these distinct or somewhat confluent into short irregular rounded ridges; groove straight, extending from near base to near apex, open, very narrowly linear or cuneate-linear, edges not thickened.

Cryptantha Rollinsii, sp. nov.

Planta biennis griseo-viridis hispida; caulibus erectis 1–2 dm. altis

simplicibus solitariis vel raro 2–3 e radice simplice palari erumpentibus; foliis crassiusculis rigidis evidenter costatis utrinque pilos breves graciles erectos vel ascendentes et pilos rigidos longos e basi pustulata orientes erectos conspicue gerentibus; foliis basalibus abundanter pustulatis dense rosulatis sub anthesi desiccatis ca. 3 cm. longis ca. 6 mm. latis paullo infra apicem latioribus deinde basim versus in petiolum 1–2 mm. latum gradatim attenuatis; foliis caulinis 3–5 cm. longis, 5–8 mm. latis, pluribus, superioribus paullo reductis, 1–2 cm. distantibus, oblanceo-spathulatis vel anguste oblongis, apice obtusis; floribus in glomerulis densis 3–6 floris 1–2 mm. longe pedunculatis ex axillis bractearum foliacearum 1–2(–3) cm. longarum erumpentibus; thyrso obovoideo vel subcylindrico 2–3 cm. crasso 3–5 cm. longo infra medium interrupto; calyce sub anthesi 7–8 mm. longo, lobis lineari-cuneatis extus villosulis et hispidis ad 2 mm. infra appendiculam corollae attingentibus; calycibus fructiferis 8–9 mm. longis induratis, basi in pedicellum crassum rigidum ca. 1 mm. longum abrupte contractis; corolla alba, tubo 7–9 mm. longo subcylindrico, limbo 7–8 mm. diametro ascendente, lobis suborbicularibus 2.5–3 mm. latis, appendiculis faucis trapeziformibus puberulentibus; staminibus infra medium vel apicem versus tubi affixis; nuculis 4 elongatis ca. 3.5 mm. longis 1.5 mm. latis utrinque sublaevibus solo marginem versus obscurissime sparse rugulosis et tuberculatis, dorso convexis, margine anguste alatis, ventre obtusis, sulco recto a basi usque ad apicem nuculae gestis, clauso vel anguste aperto, basi abrupte lateque furcato, margine nullo modo incrassato.

UTAH (Uinta Basin, Uinta Co.): shale hillside on Thornes Ranch near Walker Creek, 22 mi. south of Ouray, 5500 ft., June 16, 1937, *Reed C. Rollins 1715* (TYPE, Gray Herb.); shale breaks, east side of Willow Creek, about 5 mi. north of mouth of Agency Draw, 5500 ft., fl. white, May 22, 1935, *E. H. Graham 8938* (G); talus slope, fl. white with green tube, west side of Green River, south of mouth of Sand Wash, 4500 ft., May 27, 1933, *Graham 7870* (G).

This plant was first sent me by Dr. Graham and though I believed it to be new I did not then publish it as a new species since both of his specimens were flowering plants lacking mature nutlets. Thanks to Mr. Rollins, however, I have since received excellent mature specimens from the same region in which Graham first encountered it. It proves to be a very distinct species having elongate exserted white tubular-funnelform corollas, simple bristly stems, and small nearly smooth nutlets. The gross aspect of the plant is most suggestive of *C. Bradburiana* Payson. The nutlets most suggest those of the Sierran *C. nubigena* Payson. In Payson's monograph it keys out to *C. oblata* Payson. None of these

species can be considered as a close relative of *C. Rollinsii*. In truth the species is such a distinct one that I can find no species that is clearly an immediate relative of it.

Cryptantha nubigena (Greene) Payson, Ann. Missouri Bot. Gard. **14**: 265 (1927).

Oreocarya nubigena Greene, Pittonia **3**: 112 (1896).
Cryptantha Clemensae Payson, Ann. Missouri Bot. Gard. **14**: 267, fig. 26–28 (1927).

This is a species endemic to the high Sierras, from Tulare and Inyo north to Mono and Tuolumne counties, California, chiefly between 10,000 and 12,000 ft. The type of *Oreocarya nubigena* came from the summit of "Clouds Rest" in Yosemite National Park from an altitude of about 9900 ft. The material of the species available to past monographers of this group has been very poor and scanty. Payson saw a poor isotype of the species and mistakenly identified it with plants of eastern Oregon and adjacent northernmost California. The few reasonably good specimens of this plant of the southern Sierras available to Payson he described as a new species, *C. Clemensae*. This latter name consequently falls into the synonymy of *C. nubigena* and the plant of Oregon, mistakenly called "*C. nubigena*," being without name, may be described as a new species, as follows:

Cryptantha subretusa, sp. nov.

Herba perennis caespitosa; caulibus pluribus e radice lignosa erumpentibus 5–18 mm. altis simplicibus pilos 1–2 mm. longos et pilos abundantiores 0.5–1 mm. longos conspicue gerentibus basi persistentibus foliis marcescentibus dense vestitis; foliis basalibus congestis late spathulatis 1–4 cm. longis crassis persistentibus tomentulosis maturitate griseis, lamina orbiculata vel transverse elliptica 4–8 mm. lata apice rotunda vel truncata vel subretusa basi in petiolum 0.7–2 mm. latum abrupte contracta; foliis caulinis spathulatis vel lineari-oblongis numerosis quam internodiis conspicue longioribus; faciebus folii setas appressas 1–2 mm. longas e basi pustulata orientes et pilos rigidos 0.5–1 mm. longos saepe plus minusve tortuosos et appressos valde abundantes gerentibus; inflorescentia subcylindrica densa saepe 2–3-plo longiore quam crassa 1–2.2 cm. diametro; cymis congestis numerosis scorpioideis saepe 7–9-floris in tertia parte superiore caulis gestis; rhachi cymae 5–12 mm. longa; corolla alba, limbo 3–6 mm. diametro, tubo 3–4 mm. longo lobis calycis villosis et hispidis subaequilongo; calycibus maturitate elongatis 5–7 mm. longis 3–4 mm. diametro 0.5–1.5 mm. longe pedicella-

tis; nuculis oblongo-lanceolatis 2.8–3.7 (–4.8) mm. longis, 1.6–1.9 (–2.2) mm. latis basim obtusam versus latioribus anguste marginatis, dorso convexis inconspicue tuberculatis vel breviter rugulosis, facie interiore sublaeve vel inconspicue sparseque tuberculata vel rugulosa obtusa fere per totam longitudinem sulcata; sulco lineari vel subulato basim versus inconspicue expanso.

NEVADA: Santa Rosa Mts., Humboldt Co., July 11, 1898, *Cusick 2028* (G). CALIFORNIA (Siskiyou Co.): crest of long bare easterly slope of Mt. Eddy, 7500 ft., in compact gravel, July 9, 1920, *Heller 13435* (NY); near summit of Redshale Mt., east of Medicine Lake, pumice sand, 8000 ft., Aug. 18, 1923, *Applegate 3869 A* (G). OREGON: Crater Lake, Klamath Co., pumice slope of Cloud Gap, 8000 ft., 1934 and 1936, *Applegate 8198* (St.), *10875* and *10878* (G); Crater Lake, pumice slope on rim, 7000 ft., 1935, *Thompson 12206* (TYPE, Gray Herb.); Crater Lake, eastern rim in deep sand, 1924, *M. S. Baker 629* (G); Crater Lake, pumice near rim, 1929, *Wynd 1637* (G); about 4 mi. northwest of Adel, Lake Co., high sterile slope, June 1937, *Peck 18480* (G); above Blitzen Gorge, open rocky crest of Steens Mt., Harney Co., 9000 ft., July 1935, *Thompson 12152* (G); Pine Creek, Baker Co., alpine perennial, Sept. 1879, *Cusick* (G); east side of Lostine Canyon, 18 mi. above Lostine, Wallowa Co., July 1933, *Peck 17854* (St.; NY); above Jewett Lake, dry talus slope a mile south of Arenoid Lake, Wallowa Co., July 1933, *Peck 18063* (NY, St.); above Ice Lake, on high sterile slope, Wallowa Co., July 1934, *Peck 18511* (NY, St.).

The account of *C. nubigena* given in Payson's monograph applies almost entirely to this new species. Most of the specimens he cites, his description of the species, and his illustration of the nutlet, belong to *C. subretusa*. As I have indicated above, *C. nubigena* is endemic to the crests of the southern Sierras of California and does not approach, within 250 miles, the range of *C. subretusa*. The Californian plant differs from *C. subretusa* in being a weaker, more slender, more bristly plant with less firm, green, acute or obtuse basal leaves, much smaller smoother nutlets and a more interrupted inflorescence with a capitate terminal cluster and scattered smaller lateral ones below.

The present plant though evidently distinct from the Sierran *C. nubigena* is involved in the puzzling complex of forms containing *C. Sheldoni* (Brand) Payson and *C. celosioides* (Eastw.) Payson. These latter species need more study. I am of the opinion that the name *C. celosioides* should be extended to cover most of the coarse large-flowered plants of low altitudes found in Washington and Oregon and consequently most of the forms which Payson has referred to *C. Sheldoni*. The type of *C.*

Sheldoni represents one of several peculiar forms, probably local species, found in northeastern Oregon. Generally *C. subretusa* may be distinguished from the other species of Oregon by its elongate nutlet, and tomentulose thickish obtuse, truncate or subretuse basal leaves. Perhaps to it belong certain robust plants from southern Oregon (near Paisley, Lake Co., *Peck 15648*) and adjacent California (Lava Beds Nat. Monument, Siskiyou Co., *Applegate 9486* and *10514*). Flowering material from Warner Mts., Oregon (*Austin & Bruce 2270*) and from Steens Mt. (*Applegate 5645*) seems to have the habit of *C. subretusa* but the corollas are large and suggest those of *C. celosioides*.

Cryptantha hypsophila, sp. nov.

Herba perennis caespitosa; caulibus pluribus e radice profundo lignoso erumpentibus 5–15 cm. longis simplicibus hispidis pilos 2–3 mm. longos rigidos divaricatos et pilos abundantes 0.5–1 mm. longos tortuosos conspicue gerentibus; foliis basalibus 1–2.2 cm. longis 2–4.5 mm. latis spathulatis marcescentibus infra apicem latioribus deinde basim versus gradatim attenuatis apice rotundis utrinque tomentulosis pilis brevibus abundantibus et setis appressis e basi pustulata orientibus vestitis; foliis caulinis pluribus conspicuis saepe hispidis spathulatis vel linearispathulatis; inflorescentia thyrsoidea 1.5–2 cm. crassa 2–5 cm. longa densiflora subglobosa vel subcylindrica; cymis numerosis congestis glomeratis 3–7-floris; corolla ca. 7 mm. longa, tubo ad 4 mm. crasso lobis calycis aequilongo, limbo ad 5 mm. diametro; calyces fructifero 6–8 mm. longo; nuculis oblongo-lanceolatis 3–4 mm. longis 1.4–1.8 mm. latis anguste marginatis apice acutis, basi obtusis, dorse convexis inconspicue tuberculatis, ventre sublaevibus obtusis fere per totam longitudinem sulcatis; sulco lineari vel cuneato basi late furcato.

IDAHO (Blaine Co.): crest of high barren ridge at head of Boulder Creek, Sawtooth Mts., 11,000 ft., Aug. 6, 1937, *J. W. Thompson 14129* (TYPE, Gray Herb.); alpine rocky slopes of Mt. Hyndman, Sawtooth Range, 9500 ft., July 30, 1936, *Thompson 13628* (G); loose slide rock, Smoky Mts., 9500 ft., *Macbride & Payson 3771,* in pt. (G).

This species is known only from south-central Idaho, Blaine County, over 150 miles east of the range of *C. subretusa*. Macbride, Contr. Gray Herb. **49:** 65 (1917), and Payson, Ann. Missouri Bot. Gard. **14:** 265 (1927), identified this isolated plant of Idaho as a form of *C. nubigena*. Its relations, however, are not with the true *C. nubigena* of California but with the plant of Oregon formerly confused with it, namely *C. subretusa*. The Idaho plant is more spreading and bristly and has smaller nutlets and narrower less firm leaves that are obtuse or acute at apex.

Cryptantha Coryi, sp. nov.

Planta biennis saepe robusta e radice palari valida lignosa erumpens; caulibus pluribus erectis rigidis 15–45 cm. altis (basim versus 2.5–5 mm. crassis) saepe hispidis setas rigidas appressas vel patentes et pilos minutos flexuosos abundantes gerentibus; foliis basalibus 5–14 cm. longis crassiusculis lineari-oblanceolatis apicem acutum vel obtusum versus 4–10 mm. latis saepe strigoso-tomentulosis setas appressas 1.5–3 mm. longas rigidas e basi pustulata erumpentes et pilos minutos appressos gerentibus; foliis caulinis numerosis saepe 1.5–2 cm. distantibus saepe 2–3 cm. longis lineari-oblongis vel oblongo-lanceolatis 3–4 mm. latis acutis; cymis 3–10 scorpioideis ascendentibus elongatis e axillis foliorum supremorum erumpentibus 10–20-floris, maturitate 5–20 mm. distantibus, supremis 5–13 cm. longis, inferioribus gradatim brevioribus, thyrsum 7–18 cm. longum 4–9 cm. crassum haud densum formantibus; floribus fructiferis 3–10 mm. distantibus; bracteis cymae 5–10 mm. longis evidentibus lineari-lanceolatis; calyce sub anthesi 4–6 mm. longo subsessili, maturitate 6–10 mm. longo 1–5 mm. longe rigideque pedicellato setis et pilis minutis vestito saepe hispido; corolla alba 6–8 mm. longa, limbo 6–7 mm. diametro patente, tubo 4–5 mm. longo quam lobis calycis paullo longiore; nuculis 4 laevibus angulatis 2.5–3 mm. altis et latis eis *C. Jamesii* similibus margine haud conniventibus.

TEXAS: 16 mi. northeast of Ft. Stockton, Pecos Co., 1933, *Cory 5599* (G); about 2 mi. west of Longfellow, Pecos Co., Apr. 15, 1936, *V. L. Cory* (TYPE, Gray Herb.); near Persimmon Gap, Brewster Co., fl. white, 1931, *McKelvey 1979* (G); 55.8 mi. south of Alpine, Brewster Co., Apr. 13, 1936, *Cory* (G); Feodora, Terrell Co., dry rocky plain, 1928, *E. J. Palmer 33575* (G); 8 mi. east of Langtry, Val Verde Co., Apr. 6, 1939, *Cory* (G); 7 mi. southeast of Del Rio, Val Verde Co., April 1, 1939, *Cory* (G); Big Spring, Howard Co., stony hills, June 11, 1900, *Eggert* (G); Big Spring, deep sand, 1928, *E. J. Palmer 34009* (G); Ross Place, Tom Green Co., 1929, *Cory 651* (G); Upper Concho, sandy hills and plains, *Reverchon 2120* (G); between Uvalde and Del Rio, fl. white, 1931, *McKelvey 1891* (G); without data, *Wright 1566*, in pt. (G).

This is the plant of Texas which Payson treated as "*C. Palmeri*." It is known from Reeves and Brewster east to Howard, Tom Green and Kinney counties, Texas, and is evidently different from the type and only known collection of *C. Palmeri* (Gray) Payson, from the mountains south of Saltillo, Coahuila. The Mexican plant is a perennial with a slender multicipital caudex producing more slender and more densely strigose basal leaves, more slender stems, smaller corollas with a dis-

tinctly narrower limb, and finally an inflorescence of glomerules rather than elongating scorpioid cymes. The coarse habit, the biennial root and the very well developed elongate scorpioid cymes quickly distinguish *C. Coryi* from true *C. Palmeri* of Mexico. I do not believe that these two species are even immediately related. As Payson has indicated this Texan plant has affinities with *C. Jamesii* var. *multicaulis* (Torr.) Payson. The true Mexican, *C. Palmeri* has its closest relation in *C. crassipes* described below.

Cryptantha crassipes, sp. nov.

Herba cinerea e radice perenni valida cortice nigrescente obtecta oriens; caulibus pluribus erectis simplicibus 6–30 cm. altis plus minusve hispidis setis longis et pilis mollibus brevibus laxe appresseque vestitis, basi ima persistentibus induratis, basibus petiolorum marcidis crasse squamoso-vestitis caudicem crassum multicipitalem conspicuum formantibus; foliis basalibus congestis crassiusculis lineari-spathulatis vel anguste lineari-oblanceolatis 4–6 cm. longis 2–6 mm. latis utrinque dense pallideque strigosis (indumento e setis 1–2 mm. longis rigidis e basi pustulata orientibus et pilis ca. 0.5 mm. longis flexuosis mollibus composito) apice obtusis vel rotundis; foliis caulinis sparsis 1.5–3 cm. distantibus 1–2 cm. longis indumento laxe appresso vestitis plus minusve hispidis; floribus glomeratis sub anthesi in inflorescentiam capitatam densam 1–2.5 cm. diametro caulem sparse foliatum terminantem aggregatis; inflorescentia fructifera ambitu obovata vel oblongo-obovata ex glomerulo terminali multifloro 2.5–3 cm. diametro congesto latiore quam longo et infra glomerulum maximum ex glomerulis 1–3 parvis 1–5-floris 1–2 cm. longe pedunculatis in axillis foliorum supremorum 1–2 cm. longorum 5–25 mm. distantium gestis composita; cymis omnino glomeratis fructiferis congestis vix longioribus quam latis haud elongato-scorpioideis; corolla ut videtur alba conspicua, limbo patente ca. 8 mm. diametro, lobis orbicularibus ca. 2.2 mm. diametro, tubo ca. 9 mm. longo; calyce sub anthesi ca. 9 mm. longo, lobis cuneatis fere apicem tubi corollae attingentibus setis et pilis laxe appressis dense vestitis, maturitate paullo accrescentibus, 1–3 mm. longe pedicellatis; nuculis 4 fructum hemisphaericum formantibus crassis angulatis 3.5–4 mm. longis ca. 3 mm. latis a dorso visum orbiculari-triangularibus vel ovato-triangularibus, margine lateraliter conniventibus dorso convexis opacis inconspicue rugulosis, ventre angulatis sublaevibus, sulco angustissimo lineato.

Texas (Brewster Co.): tributary of Alamo de Caesario, 18 mi. north of Terlingua, April 3, 1939, *V. L. Cory* (G); 55 mi. south of Alpine,

April 13, 1936, *Cory* (G); 6.5 mi. east of Agua Fria Springs, April 13, 1936, *Cory 18613* (TYPE, Gray Herb.).

This interesting species comes from the Big Bend region of Texas. It is probably most closely related to the plant collected by Edward Palmer in the mountains south of Saltillo, Coahuila, and the one properly bearing the name, *C. Palmeri* (Gray) Payson. Both species are perennials having a multicipital caudex, narrow pallid densely strigose basal leaves and an inflorescence of glomerules rather than elongating scorpioid cymes. The Texan plant, however, is coarser than the Mexican plant and has a much coarser heavier caudex, non-bristly calyx-lobes, and a corolla-limb nearly twice as broad. The type and only known collection of *C. Palmeri* is immature and ripe nutlets are unknown. The mature nutlets of *C. crassipes* are rugulose. The only other member of the group of *C. Jamesii* (Torr.) Payson, to which *C. crassipes* and *C. Palmeri* belong, which has roughened nutlets is *C. oblata* (Jones) Payson. This latter species ranges in Texas from El Paso southeastward into Presidio County. It has elongating scorpioid cymes, exserted corolla-tube, tuberculate nutlets, and a less persisting root.

Hackelia Sharsmithii, sp. nov.

Herba perennis; caulibus gracillimis pluribus simplicibus rigidiusculis fragilibus 1–2 mm. crassis inconspicue strigosis 1–3 cm. altis erectis vel ascendentibus, basi vestigiis petiolorum emarcidorum fuscis conspicue obtectis, caudicem multicipitem formantibus; foliis viridibus obscure nervatis utrinque inconspicue strigosis; foliis inferioribus majoribus, lamina lanceo-elliptica vel oblongo-lanceolata 4–7 cm. longa 14–30 mm. lata, apice acuta vel obtusa, basi in petiolum alatum 2–6 cm. longum contracta; foliis caulinis 6–9 sessilibus oblongis vel ovatis vel lanceo-ovatis 2–3.5 cm. longis 8–18 mm. latis, apice acutis, basi rotundis vel cordatis; cymis racemiformibus terminalibus geminatis vel ternatis (raro solitariis in axillis foliorum superiorum) maturitate 2–10 cm. longis 2–14-floris plus minusve bracteatis, bracteis saepe omnino subulatis inconspicuis 1–2 mm. longis rariter 1–2 grandibus foliaceis 5–20 mm. longis et 3–10 mm. latis; calyce sub anthesi 2–2.7 mm. longo sparse strigoso, lobis lanceolatis, pedicellis 1–6 mm. longis; corolla azurea ca. 4 mm. longa, limbo ad 6 mm. diametro, tubo ca. 2 mm. longo non raro medium versus constricto, lobis ca. 1.7 mm. longis apice rotundis; appendiculis fornicalibus lunatis, margine superiore ciliolatis, latere interiore valde convexis; antheris ca. 0.2 mm. longis apice fere sinus loborum corollae attingentibus; pedicellis fructiferis laxe recurvatis ad 12 mm. longis; nuculis 4 sine margine 2.6–3 mm. longis et 1.1–1.4 mm.

latis lanceolatis, margine appendiculis coerulescentibus subulatis 1.3–1.9 mm. longis (apice glochidiatis) basim versus plus minusve confluentibus ornatis, dorso convexis granulatis plus minusve muricatis et appendiculatis, (appendiculis 1–3 ca. 1 mm. longis); gynobasi 1–1.2 mm. longo; stylo ca. 1 mm. longo.

CALIFORNIA: shelter of rocks in cirque northwest of Consultation Lake, Lone Pine Canyon, Inyo County, 12,000 ft., Aug. 19, 1937, *C. W. Sharsmith 3280* (G); shelter of boulders on recent moraine in cirque east of Mt. Muir, Inyo Co., 12,100 ft., Aug. 20, 1937, *Sharsmith 3336* (G); shelter of granite boulders above Mirror Lake, Lone Pine Canyon, Inyo Co., 11,000 ft., Aug. 21, 1937, *Sharsmith 3354* (TYPE, Gray Herb.); in shelter of rocks, summit of Boreal Plateau, southwest of Siberian Outpost, Tulare County, 11,400 ft., Aug. 27, 1937, *Sharsmith 3415* (G).

This remarkable species is a recent discovery in the Mt. Whitney region in the high southern Sierras of California. The species sets the southwestern limit for the genus in the United States and presents a new type of habitat and a new growth-form for the genus. The plant grows under rocks above timberline and has short brittle spreading tufted leafy stems and accordingly a gross habit very suggestive of the dwarf alpine and subalpine Mertensias found in the Rocky Mountains. Nothing like it is known in *Hackelia*. Its habit represents a transition between the relatively coarse erect habit characteristic of most Hackelias and that of the slenderly caulescent and sparingly strigose Asiatic species of *Eritrichium*. Furthermore *H. Sharsmithii* frequents the arctic-alpine region which heretofore has been thought to be characteristic of *Eritrichium*. The two genera are now revealed as differing in little more than the direction of their fruiting pedicels,— erect or slightly curved outward in *Eritrichium* and decurved or reflexed in *Hackelia*. It is indeed surprising that this very distinct plant could remain unknown in the reasonably well botanized area about Mt. Whitney and then be collected by one botanist at four different stations in a single season. It ranks along with *Mertensia bella* Piper and *Cryptantha Thompsonii* Johnst., as one of the most distinct and interesting additions to the borage-flora of the Pacific States which has been made in the past twenty-five years.

Pectocarya heterocarpa (Johnston), comb. nov.

Pectocarya penicillata var. *heterocarpa* Johnston, Contr. Gray Herb. **70**: 37 (1924).

This plant is undoubtedly distinct from *P. penicillata* (H. & A.) DC. It differs in fruit, calyx and geographic distribution. The fruit borne on

the branches consists of 4 nutlets the opposed ones on each side being more or less similar and differing from the other pair in size, form, and attachment. One pair of nutlets is more or less ascendingly curved and is usually margined. The other pair is more or less recurving and unmargined with the adaxial nutlet bent back against and frequently somewhat adhering to the pedicel. The calyx is strongly oblique and asymmetrical. The abaxial side of the fruiting calyx is elongate. The floral receptacle is prolonged obliquely out on the abaxial side, and the pedicel appears to be lateral in attachment. In fact the elongated distorted receptacle seems to be merely a broadened prolongation of the pedicel bearing a pinnate arrangement of unequal sepals. The calyx-lobes are very unequal even at anthesis. The two distal abaxial lobes are nearly equal and are obviously the largest. The larger of these two distal lobes subtends a margined ascending nutlet, the shorter one a decurved unmargined nutlet. The remaining three lobes of the calyx are successively smaller and project (at right angles) from along the side of the elongate receptacle. The smallest (ca. 1 mm. long) is the one nearest the pedicel and at maturity it projects laterally out from under the adaxial decurved unmargined nutlet. In *P. penicillata* the calyx is supported by a centrally attached pedicel and the calyx and lobes are not obliquely distorted. The four nutlets are each subtended by consimilar calyx-lobes. A single reduced lobe projects out between the two axial nutlets. This type of calyx is normal for the genus. The obliquely distorted calyx which I have described for *P. heterocarpa* is a very conspicuous and real departure from this normal type and it is otherwise known only in *P. peninsularis* newly described below. I have found no transitions connecting it with the normal type of calyx. This remarkable development in *P. heterocarpa* supplementing such other characters of the species as the heteromorphy of nutlets within the fruit and the abundance of distinctive (perhaps cleistogamic) fruit about the very base of the plant, leave little doubt as to its specific distinctness. It is one of the very distinct species in the genus! *Pectocarya heterocarpa* ranges from northern Sonora, through the southwestern half of Arizona, north into southern (Clark County) Nevada and extreme southwestern (Washington County) Utah, and west into the Colorado and Mohave deserts of California (north to the Death Valley area). It probably occurs in extreme northeastern Baja California, as an extension south from the Colorado Desert, though I have seen no specimens from actually south of the Californian boundary. In middle Baja California it is represented by the closely related *P. peninsularis*. True *P. penicillata* has a very different range. From Wyoming, Idaho and eastern Washington, with an outlying station in the dry in-

terior of British Columbia, it ranges south into the northern half of Nevada and, west of the Sierra Nevada, south into coastal southern California and northwestern Baja California. It occasionally extends through the low passes onto the edge of the Mohave and Colorado deserts as for example near Mohave, Elizabeth Lake, and Jacumba, but always remains easily distinguished from *P. heterocarpa*.

The strongly heteromorphic nutlets and the distorted calyx of *P. heterocarpa* give new reasons for believing that the genus *Harpagonella* is, indeed, a much modified derivative of *Pectocarya,* characterized by its much accrescent and highly specialized irregular calyx and modified fewer nutlets. The two largest calyx-lobes of *P. heterocarpa* are the homologues of the distal pair of lobes in other Pectocaryas and also of the two united lobes forming the beak in *Harpagonella*. A study of the calyx at anthesis, and later, seems to show that these two lobes are abaxial in position. This places the odd reduced lobe next to the axis which is a position rare and unusual among the Gamopetalae, and in fact among all dicotelydons.

Pectocarya peninsularis, sp. nov.

Herba annua gracillima prostrata strigosa vel hispidula basi caules paucos vel multos 5–15 cm. longos gerens; foliis angustis linearibus 1–4 cm. longis 0.5–1 mm. latis; floribus dimorphis; floribus infimis imam ad basim caulis gestis verisimiliter cleistogamicis; nuculis florum infimorum valde heteromorphis 2 mm. longis ad 1 mm. latis apicem versus latioribus, nucula abaxialari evidenter marginata (margine dentato) sparse strigosa, nucula axialari pedicello plus minusve adnata haud marginata dorse convexa straminea subglabra, nuculis lateralibus inconspicue marginatis strigosis; floribus caulinis chasmogamicis; nuculis florum caulinorum heteromorphis ad 2 mm. longis, nucula abaxiali margine pallido 0.5–0.8 mm. lato grosse dentato (apicibus dentium in pilum uncinatum productis) conspicue ornata in ambitu superne visa elliptico-ovata; nuculis lateralibus abaxiali plus minusve similibus, margine inconspicuo dentibus subulatis distantibus armatis.

Baja California: 26 mi. south of Pozo Aleman, March 4, 1935, *Shreve 7004* (G); 11 mi. southeast of Mesquital, Feb. 8, 1935, *Haines & Stewart* (G); wash 2 mi. north of Millers Landing, Feb. 10, 1935, *Haines & Stewart 160* (G); Playa Santa Catarina, March 10, 1930, *Wiggins 4442* (G); semidesert hills between El Marmol and Rosario, March 12, 1930, *Wiggins 4465a* (G); sandy wash at junction of El Marmol and San Fernando roads, 25 mi. from El Marmol, March 5, 1930, *Wiggins 4345* (G); Santa Marco Plains and low adjacent hills, 23.5 mi. south of Ham-

ilton Ranch, 100 ft. alt., March 3, 1930, *Wiggins 4305* (TYPE, Gray Herb.); flats 8 mi. north of Hamilton Ranch, a mile inland, March 2, 1930, *Wiggins 4291* (G); 7 mi. east of Santo Tomas, Feb. 2, 1935, *Shreve 6826* (G).

This species is closely related to *P. heterocarpa* and has the heteromorphic nutlets and distorted calyx of that species. It ranges in the midsection of the peninsula of Baja California, while its relative is known south of the Mexican boundary only in northern Sonora. The peninsular plant differs in its smaller more broadly winged nutlets. In those nutlets of the heteromorphic fruit which are winged, the margin is spreading, broad, and coarsely toothed. Viewed from above these nutlets are elliptical-ovate rather than panduriform or oblong or linear-oblong. The four nutlets of the fruit are in one plane and not, as in *P. heterocarpa,* with two upcurving and two decurving. The axial nutlets are unmargined, convex above and nearly glabrous.

ARNOLD ARBORETUM,
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JOURNAL

OF THE

ARNOLD ARBORETUM

VOL. XX OCTOBER, 1939 NUMBER 4

FURTHER NOTES ON JASMINUM

CLARENCE E. KOBUSKI

IN THIS PAPER are presented several new combinations and a new variety in the section ALTERNIFOLIA of the genus *Jasminum*. These combinations are all within the two species, *J. humile* L. and the erstwhile *J. heterophyllum* Roxburgh. In the case of the former it is merely a subdivision of a broad specific concept while the changes in the latter are the result of nomenclatural rules.

In a former paper on Chinese jasmines* I interpreted *J. humile* in a rather broad sense and like many other authors, included within the species *J. revolutum* Sims and *J. Wallichianum* Lindley which, at least in horticultural literature, are generally considered distinct species and are grown quite extensively under these names. For this reason, even though there is overlapping among the three species and although in some instances it is difficult to classify a specimen positively, I feel that the best solution is to classify the two species *J. revolutum* Sims and *J. Wallichianum* Lindley with *J. humile* L., but separate them as varieties rather than merge them in a single unit.

My attention has been drawn to the fact that there exists for the species *J. heterophyllum* Roxburgh, an earlier homonym *J. heterophyllum* Moench which is a synonym of *J. fruticans* L. This necessitates the finding of a new name. As no valid synonym exists, it seems best to use the Latin equivalent "*diversifolium*" as the specific epithet for this *Jasminum*.

*Kobuski in Jour. Arnold Arb. 13: 145–179. 1932.

Jasminum diversifolium, nom. nov.

Jasminum heterophyllum Roxburgh, Hort. Beng. 3. 1814, nomen; Fl. Ind. ed. Carey et Wall. **1**: 99, 164. 1820; Fl. Ind. ed. Carey, **1**: 100. 1832.— Schultes, Mant. 92. 1822.— D. Don, Prodr. Fl. Nepal. 106. 1825.— DeCandolle, Prodr. **8**: 312. 1844.— Loudon, Arb. Frut. Brit. ed. 2, **2**: 1249. 1854.— C. B. Clarke in Hooker f., Fl. Brit. Ind. **3**: 601. 1882.— Non Moench, 1794.

Jasminum arboreum Hamilton ex D. Don, Prodr. Fl. Nepal. 106. 1825, in syn.— DeCandolle, Prodr. **8**: 312. 1844, in syn.— Loudon, Arb. Frut. Brit. ed. 2, **2**: 1249. 1854, in syn.— Non Schultes, 1822.

Jasminum macrophyllum Hort. ex DeCandolle, Prodr. **8**: 312. 1844, in syn.

The name *J. heterophyllum* Roxburgh (1814, 1820) cannot be retained as valid because of an earlier homonym, *J. heterophyllum* Moench (1794), which in turn is a synonym of *J. fruticans* L.

Although two names have been listed in literature as synonyms of *J. heterophyllum* Roxb. neither can be accepted as valid. The first of these two names, *J. arboreum* Hamilton mss., was listed by D. Don (Prodr. Fl. Nepal. 106. 1825). There is an earlier *J. arboreum* Schultes (Mant. **1**: 90. 1822).

The other name, *J. macrophyllum* Hort., listed as a synonym by DeCandolle, represent merely a horticultural name, not validly published, and probably without a type specimen.

Therefore a new name "diversifolium" is proposed above, being a Latin equivalent of its earliest and best fitting name.

The varietal changes are listed below:

Jasminum diversifolium Kobuski var. **glabricorymbosum** (W. W. Smith), comb. nov.

Jasminum heterophyllum Roxburgh var. *glabricorymbosum* W. W. Smith in Notes Roy. Bot. Gard. Edinburgh, **12**: 209. 1920.— Kobuski in Jour. Arnold Arb. **13**: 149. 1932.

Jasminum diversifolium Kobuski var. **subhumile** (W. W. Smith), comb. nov.

Jasminum subhumile W. W. Smith in Notes Roy. Bot. Gard. Edinburgh, **8**: 127. 1913.

Jasminum heterophyllum Roxburgh var. *subhumile* (W. W. Smith) Kobuski in Jour. Arnold Arb. **13**: 149. 1932.

Jasminum humile Linnaeus, Spec. Pl. **1**: 7. 1753.— Ker in Bot. Reg. **5**: t. 350. 1819.— DeCandolle, Prodr. **8**: 313. 1844.— Boissier, Fl. Or. **4**: 42. 1875.— Nicholson, Illustr. Dict. Gard. **2**: 207. 1887.— Schneider, Ill. Handb. Laubholzk. **2**: 840. 1911.

Jasminum inodorum Jacquemont apud Decaisne in Jacquemont, Voy. 4: 137, t. 143. 1843.— DeCandolle, Prodr. 8: 312. 1844.

CHINA. S z e c h u a n : *Harry Smith 2463; E. H. Wilson 2809,* (Veitch Exped.) *4077, 4078.* Y u n n a n : *Simeon Ten 375, 515.*

PERSIA: Teheran, on road to Doshan-tepe, ex *Herb. Bornmüller.*

This was known to Linnaeus and his predecessors only as a cultivated plant. Its habitat has generally been given as southeastern Europe and Persia, but its spontaneous occurrence there has been doubted (see Boissier, l. c.). It is highly probable that *Jasminum humile* is a native of western China and was introduced, as were *Syringa persica* L., *Prunus Persica* (L.) Batsch and *P. Armeniaca* L. (cf. Laufer, Sino-iranica, 359 ff.; also Rehder in Jour. Arnold Arb. 5: 214. 1924) over the ancient trade route from China to Persia where these plants are found now as escapes from cultivation.

This species, as accepted by some authors in the broad sense, includes the very closely related species *J. revolutum* and *J. Wallichianum* and makes a very variable unit. On the other hand, when this combined unit is separated into three individual species, as it is generally in horticultural literature, the worker is confronted with considerable overlapping among species. Careful study of the literature shows, as far as I know, no separation by varieties as I am making in this paper. Formerly, because of the overlapping of species, I included all three in one species.

The typical form of the species is characterized by 3–5, rarely 7, leaflets which are ovate to elliptic to oblong and usually 2 cm. or less in length. The terminal leaflet is usually obtuse at the apex. The inflorescence is composed of few flowers (2–6) as contrasted with the many-flowered inflorescences of var. *revolutum.*

Jasminum humile L. var. **kansuense,** var. nov.

A typo differt foliolis late ovalibus vel ellipticis vel obovatis; calycis lobis subulato-setaceis 1–2 mm. longis, tubo subaequalibus; floribus non visis.

CHINA: Southwestern Kansu, Lower Tebbu country, dry arid slopes with oaks in Nyibaku, alt. 6800 ft., *J. F. Rock 14797,* TYPE, September 9, 1926 (shrub 4–5 ft. with rich green leaves and yellow flowers).— Also, same general locality, *J. F. Rock 14653, 15035.*

This variety resembles the type of the species more closely than any of the other varieties in all respects save the calyx-lobes. While they are hardly more than mere triangular projections in the species, in var. *kansuense* they are subulate-setaceous, 1–2 mm. long, equalling and in some instances exceeding the calyx-tube in length. The leaves are

usually 3-foliolate, occasionally 5-foliolate and sometimes, near the base of the branchlets, unifoliolate.

Closely related is *J. fruticans* L. which can be separated from var. *kansuense* by its much longer calyx-lobes that have a slight tendency to be foliaceous and by its spathulate leaves which are always 3-foliolate or occasionally uni-foliolate, never 5-foliolate. Also, its range does not extend into China.

Jasminum humile L. var. **siderophyllum** (Léveillé), comb. nov.

Jasminum Mairei Léveillé in Fedde, Rep. Spec. Nov. **13**: 337. 1914.
Jasminum Mairei Léveillé var. *siderophyllum* Léveillé, Cat. Pl. Yunnan, 179. 1916.

YUNNAN: haut plateau de Tai hai, alt. 3200 m., *E. E. Maire s.n.* (MEROTYPE of *J. Mairei* var. *siderophyllum*), Juillet [1911–1913], (arbuste buissonant, haut 0.60 m.; fl. roses); patûrages des montagnes à Pé-ling-tsin; alt. 3200 m., *E. E. Maire s.n.* (MEROTYPE of *J. Mairei*), (Jasm. buissonant, haut 0.60 m.; fl. jaunes inodores). Other Yunnan collections, *E. E. Maire 245; H. T. Tsai 53684, 57305, 57352, 57578, 57735; J. F. Rock 3293, 24705; G. Forrest 4659; O. Schoch 36; C. Schneider 3222, 3264.* SZECHUAN: *Harry Smith 1890; J. F. Rock 24144, 24564; T. T. Yü 1049; H. Handel-Mazzetti 2223, 2498; C. Schneider 1302; 4091.*

This variety is characterized by leaves with 3–5 leaflets (usually 5) which resemble var. *glabra* in the ovate-lanceolate shape. The terminal leaflet is subcaudate. A sparse appressed setose pubescence is found on the upper surface of the leaflets and especially on the revolute margin where in some instances it appears spinulose. In specimens which are nearly glabrous, this spinulose character of the margin can still be found.

The calyx-lobes are short, usually somewhat triangular, much shorter in length than the calyx-tube and somewhat ciliate. Like the species and all the other varieties, the stems are angled.

In all specimens with flowers, except for the type, the color is recorded as yellow. In the type specimen it is recorded as "roses." I feel quite certain that this is an error, because it appears, in the dried state, no different from all the other specimens.

Léveillé gave the name *siderophyllum* to his variety because the leaves were ferrugineous on the lower surface. Although it is true for the type, this character hardly holds for the whole variety. Many specimens are ferrugineous on the lower surface, yet on the other hand, others may be a pale green.

This variety has been cultivated in the United States for about thirty years.

Jasminum humile L. var. **revolutum** (Sims), comb. nov.

Jasminum revolutum Sims in Bot. Mag. **42**: t. 1731. 1815.— Ker in Bot. Reg. **3**: t. 178. 1817; **6**: Notes 2. 1820.— Loddiges, Bot. Cab. **10**: t. 966. 1824.— DeCandolle, Prodr. **8**: 313. 1844.— Wight, Icon. Pl. Ind. Orient. **4**: 14, t. 1258. 1850.— Boissier, Fl. Or. **4**: 42. 1875.— Schneider, Ill. Handb. Laubholzk. **2**: 839, figs. 527 m-n, 528 g-i. 1911.

Jasminum chrysanthemum Roxburgh, Cat. Hort. Beng. 3. 1814, nomen; Fl. Ind. **1**: 98. 1820.

India. West Nepal: *Bis Ram 147, 360, 462.* Punjab: *W. Koelz 214, 1889; R. R. Stewart 2467; R. N. Parker s.n.; C. S. Rowat 77.* Kashmir: *E. H. Wilson s.n.*

This variety is characterized by a many-flowered inflorescence with corolla-limb 2–2.5 cm. across and by leaflets 5–7 in number, ovate, acuminate 2–6 mm. long.

Among the specimens cited above, a few, namely *Koelz 214, Rowat 79, Stewart 2467* and *Ram 360* showed a marked similarity to the type of the species making it difficult to decide definitely in which category to place them. Both *Koelz 214* and *Ram 360* have leaflets somewhat obtuse, occasionally to seven or nine, a number which is unusually high for the species.

This variety, it appears from the material at hand, is more successfully or preferably cultivated than the species itself, or any of its other varieties. In the herbarium of the Arnold Arboretum are excellent specimens from England, Germany, Austria, France, United States and Argentina.

Jasminum humile L. var. **glabrum** (DC.), comb. nov.

Jasminum Wallichianum Lindley in Bot. Reg. **17**: t. 1409. 1831.— Bean, Trees Shrubs Hardy Brit. Isl. **1**: 662. 1914.

Jasminum pubigerum D. Don β *glabrum* DC. Prodr. **8**: 312. 1844.

Jasminum pubigerum sensu Loudon, Arb. Frut. Brit. ed. 2, **2**: 1250, fig. 1077. 1854. Non D. Don.

Distribution: Nepal.

No spontaneous representatives of this variety have been seen by the author. Authentic cultivated specimens from Germany, France, England and United States have been studied.

The pinnate leaves of this variety have 7–13 leaflets which are ovate to lanceolate, 2–5 cm. long. The terminal leaflet is usually quite caudate. The inflorescence is few-flowered (three are the maximum in specimens studied). These characters mentioned easily separate it from var. *revolutum*.

The name var. *glabrum*, although necessary, is an unfortunate name because both the species and var. *revolutum* are usually strictly glabrous. It would be better to use Lindley's specific epithet for the name of the

variety, but according to the rules of nomenclature, the oldest varietal epithet must be used which is DeCandolle's *J. pubigerum* var. *glabrum*.

Jasminum pubigerum D. Don is separated only by its pubescence. One wonders how pubescent the actual type may be! DeCandolle evidently did not see the type of *J. pubigerum* when he incorporated the species in his Prodromus; the only material he saw was glabrous and from that he named his variety. His description of *J. pubigerum* is drawn up from D. Don's description and with the exception of transposed phrases is identical.

G. Don (Gen. Syst. Gard. Bot. **4**: 64. 1837) and Loudon (Arb. Frut. Brit. ed. 2, **2**: 1250, fig. 1077. 1854) consider *J. Wallichianum* synonymous with *J. pubigerum*.

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NEW SPECIES, VARIETIES AND COMBINATIONS FROM THE COLLECTIONS OF THE ARNOLD ARBORETUM

ALFRED REHDER

Sequoiadendron giganteum (Lindl.) Buchholz f. **pendulum** (Carr.), comb. nov.

Wellingtonia pendula Carrière in Rev. Hort. **1870–71**: 526 (Sept. 1871).
Wellingtonia gigantea pendula [Otto in] Hamburg. Gart. u. Blumenzeit. **27**: 573 (Dez. 1871).— Bellair in Rev. Hort. **1906**: 394, fig. 157 (1906).
Sequoia gigantea var. *pendula* Lavallée, Arb. Segrez. 271 (1877).— Rehder in Möller's Deutsch. Gärtn.-Zeit. **17**: 133, fig. (1902).— Henry in Elwes & Henry, Trees Gt. Brit. Irel. **3**: 700 (1908).— Roeding in Gard. Chron. ser. III. **78**: 107, fig. 41 (1925).
Wellingtonia gigantea pendula vera Anon. in Jour. For. Lond. **3**: 260 (1879).— Henry in Elwes & Henry, Trees Gt. Brit. Irel. **3**: 701, footnote (1908).
Sequoia gigantea pendula Nicholson, Ill. Dict. **3**: 422 (1887).
Sequoia Washingtoniana pendula (Beissn.) Sudworth in Bull. U. S. Div. For. **14**: 62 (Nomencl. Arb. Fl. U. S.) (1897).
Sequoia Wellingtonia var. *pendula* Kent, Veitch's Man. Conif. ed. 2, 275 (1900).— M. L. Green in Kew Hand-list Conif. ed. 4, 70 (1938).
Sequoia gigantea Barroni pendula Henry in Elwes & Henry, Trees Gt. Brit. Irel. **3**: 701 (1908).

This distinct and striking form was first mentioned by Carrière in 1871, who saw a plant 1.30 m. tall with reflexed branches forming a compact cone. As stated by the writer (l. c.) it was found in a seed-bed by Lalande of Nantes and put on the market by Paillet of Chatenay-les-Sceaux near Paris.

The new combination made above is necessary if one accepts the generic separation proposed by Buchholz (in Am. Jour. Bot. **26**: 536. 1939) of *Sequoia Wellingtonia* (Lindl.) Seem. (*S. gigantea* Dcne., not Endl.) and *S. sempervirens* Endl. which appears to be well founded, and in my opinion should be accepted.

The best tree of this form is, or was growing in the Arboretum de la Maulévrie, formerly M. Allard's arboretum, at Angers in France where I saw and photographed it in 1901. At that time, it was 18.5 m. tall and the trunk 80 cm. in girth; in 1907 it was measured by Mr. H. J. Elwes

(See Henry, l. c.) and was found to be 44 ft.[1] tall and around the branches at the base only 13 ft. in circumference. Similar pendulous forms have originated elsewhere and are listed as *Wellingtonia gigantea pendula vera* and *Sequoia gigantea Barroni pendula* (see above).

Besides this form, a number of other forms have been recorded from cultivation under various names, some of them apparently synonyms; the following named forms which appeared in horticultural literature are given under the combination under which they were first mentioned: *Gigantabies Wellingtoniana argentea, G. W. aurea, G. W. elegantissima* and *G. W. nobilissima* Nelson (1866), *Wellingtonia gigantea aureo-compacta* Carr. (1867), *W. g. flavescens* Beissn. (1884), *W. g. gracilis* Otto (1866), *W. g. pygmaea* Otto (1866), *W. g. stricta* Sénécl. (1868), *W. g. variegata* Hort. ex Carr. (1867), *Sequoia gigantea columnaris* Schelle (1909), *S. g.* var. *crassifolia* Lav. (1877), *S. g. glauca* Otto (1860), *S. g. Holmesii* P. Sm. ex Beissn. (1891), *S. g. lutea* Beissn. (1891), *S. g.* var. *nana* Zederb. (1907), *S. g.* var. *pyramidalis* Lav. (1877), *S. g. pyramidata compacta* Nichols. (1900), *S. glauca pyramidalis compacta* Otin ex Chargeraud (1889), *S. Washingtoniana glaucescens pyramidato-compacta* Sudw. (1897). I have seen none of these forms and many have probably disappeared from cultivation, or can now be found only in a few collections.

Betula platyphylla Sukatchev in Trav. Mus. Bot. Acad. Sci. St. Petersb. **8:** 220, pl. 3 (1911).— Hara in Jour. Jap. Bot. **13:** 384 (1937).

Betula alba L. subsp. 4. *latifolia* γ. *Tauschii* Regel in Bull. Soc. Nat. Moscou, **38**[2]: 399, t. 7, fig. 11–14 (1865); in DC. Prodr. **16**[2]: 165 (1868); non *B. latifolia* Tausch.

Betula latifolia sensu Komarov in Act. Hort. Petrop. **22:** 38 (Fl. Mansh. II) (1903), non Tausch.

Betula mandshurica (Reg.) Nakai in Bot. Mag. Tokyo, **29:** 42 (1915).

Betula platyphylla Sukatchev is apparently the correct name for the group of birches classed by Winkler under Siebold's nomen nudum *B. japonica* which is untenable on account of the earlier homonym *B. japonica* Thunb., a synonym of *Alnus japonica* (Thunb.) Sieb. & Zucc. Early in 1938, when I took up Nakai's binomial *B. mandshurica* (Reg.) of 1915, neither Sukatchev's publication of 1911 nor that of Hara of 1937 was in our library, and I did not know of the combinations made by Hara until we received volume 13 of the Journal of Japanese Botany late in 1938.

[1]The two measurements show a considerable discrepancy, the height being less in 1907 than in 1901; either one of the measurements was incorrect or the top of tree had died back which is not unlikely, since my original photograph shows dry branches at the very top, scarcely visible in the reproduction.

Typical *B. platyphylla* occurs according to Sukatchev in eastern Siberia from Transbaicalia and Yakutsk to the northern Amur province. It is near var. *japonica* from which it differs chiefly in the under surface of the truncate or broad-cuneate leaves and the petioles being quite glabrous and in the narrower wings of the fruit.

Of the following varieties enumerated in Jour. Arnold Arb. **19:** 72 (1938) under *B. mandshurica,* the first three have already been transferred by Hara to *B. platyphylla,* but for the last two, new combinations become necessary.

Betula platyphylla var. **japonica** (Miq.) Hara in Jour. Jap. Bot. **13:** 384 (1937).

Betula mandshurica var. *japonica* (Miq.) Rehder in Jour. Arnold Arb. **19:** 72 (1938), which see for further citation of synonyms and literature.

Betula platyphylla var. **mandshurica** (Reg.) Hara, op. cit. 385 (1937), which see for further citation of synonyms.

Betula mandshurica (Reg.) Nakai in Bot. Mag. Tokyo, **29:** 42 (1915).—Rehder in Jour. Arnold Arb. **19:** 72 (1938).

Betula platyphylla var. **kamtschatica** (Reg.) Hara, l. c. (1937).

Betula mandshurica var. *kamtschatica* (Reg.) Rehder, op. cit. 73 (1938), which see for further citation of literature.

Betula platyphylla var. **szechuanica** (Schneid.), comb. nov.

Betula japonica var. *szechuanica* Schneider in Sargent, Pl. Wilson. **3:** 454 (1917).

Betula mandshurica var. *szechuanica* (Schneid.) Rehder in Jour. Arnold Arb. **19:** 73 (1938), which see for citation of additional literature.

Betula platyphylla var. **Rockii** (Rehd.), comb. nov.

Betula japonica var. *Rockii* Rehder in op. cit. **9:** 25 (1928).

Betula mandshurica var. *Rockii* (Rehd.) Rehder in op. cit. **19:** 74 (1938).

This variety resembles in its smaller mostly broadly cuneate leaves *B. pendula* Roth, but in the latter they are generally more cuneate and usually rhombic in outline, not tending to become rounded at base as in *B. platyphylla* var. *Rockii* which further differs in having generally only 3–4 pairs of distinct veins (4 or 5 in *B. pendula*), in the thicker texture and grayish white under surface of the leaves, stouter and shorter petioles, in the narrower catkins about 6 mm. across, in the bracts with ascending lateral rounded lobes about as long as the middle lobe and in the wings about as wide or even narrower than the nutlet.

Berberis Thunbergii DC. f. **erecta,** forma nova.

Berberis thunbergi pluriflora erecta Anon. in Horticulture, **13**: 48, fig. (1935).— Cole Nursery Company, Truehedge Columnberry. 16 pp. ill. Painesville, Ohio. 1936.

A typo differt ramis stricte erectis columnam densam formantibus.

Growing in the Arnold Arboretum under nos. 485–32 and 859–36. Specimens of no. 485–32 in the herbarium, collected May 24, 1939.

This form was raised by M. H. Horvath of Mentor, Ohio, sometime before 1932 and distributed by the Cole Nursery Company, Painesville, Ohio. Plants were received from that nursery by the Arnold Arboretum in 1932, and are now about 1 m. tall and 0.6 m. in diameter forming dense bushes with the lateral branches fairly closely appressed to the stems.

Magnolia Proctoriana (*M. salicifolia* ♀ × *stellata*), hybr. nov.

Arbor ramulis gracilibus glabris, annotinis rubro-fuscis vel plus minusve obscure luteo-viridibus; gemmae floriferae dense longe pilosae, foliiferi satis sparse et breviter pilosae. Folia oblonga vel oblongo-obovata, subito breviter obtuse acuminata vel acutiuscula, rarius obtusa, basi cuneata vel late cuneata, 6–9 cm. longa et 2–4 cm. lata, subtus primo praesertim ad costam et venis sparse adpresse pilosa, mox glabra, reticulata, pallide viridia; petioli glabri 0.5–1 cm. longi. Flores praecoces; sepala 3, lineari-lanceolata, 2–2.5 cm. longa, albida; petala 6–13, erecto-patentia, oblanceolata 6–8 cm. longa et 1.5–2.5 cm. lata, alba, extus secus medium basin versus purpurascentia; gynaecium staminibus fere duplo longius; pedunculus brevissimus glaber vel parce pilosus. Fructus valde tortus carpellis paucis evolutis.

Cult. in Arnold Arboretum under no. 874–28 (raised from seed of *M. salicifolia* coll. on the estate of T. E. Proctor, Topsfield, Mass. in 1928), coll. May 7, June 8 and Aug. 11, 1939, *A. Rehder* (type in herb. Arnold Arboretum).

This *Magnolia* was raised from seed of *M. salicifolia* Maxim. from which it is distinguished at once by the more numerous petals (6–13), by the pubescent leaf-buds, by the leaves being generally broader about or above the middle, more narrowly cuneate and green beneath and by other characters. The number of petals, the pubescent leaf-buds and the shape of the leaves indicate the influence of *Magnolia stellata* (S. & Z.) Maxim. which blooms at the same time. From *M. stellata* it differs chiefly in the tree-like pyramidal habit with ascending slender branches, in the narrower smaller and more pointed leaves, in the presence of 3 sepals and in the lesser number (6–12) of broader and larger more

upright petals. It does not flower as profusely as *M. stellata,* but the flowers are more conspicuous than in *M. salicifolia* and it blooms as a smaller plant.

I take pleasure in naming this hybrid for Mr. T. E. Proctor of Topsfield, Mass., who started about 1900 an arboretum on his estate which still contains a large number of interesting trees and shrubs, though in later years little has been added to the original collection.

Lindera Benzoin (L.) Bl. f. **xanthocarpa** (G. S. Torrey), comb. nov.

Benzoin aestivale Nees f. *xanthocarpum* G. S. Torrey in Rhodora, **16**: 91 (1914).

Lindera aestivalis (L.) Bl. f. *xanthocarpa* (G. S. Torrey) Rehder in Jour. Arnold Arb. **20**: 92 (1939).

When I published the combination cited above as a synonym, I unfortunately accepted the specific epithet generally used under the generic name *Benzoin.* A careful checking of the synonymy, however, showed that the two species proposed by Linnaeus, *Laurus aestivalis* and *L. Benzoin,* were never considered as representing one and the same species until Meissner in 1864 made *L. aestivalis* a variety of *Lindera Benzoin* Bl. All earlier authors had either considered the two Linnaean species as distinct as Blume did, or had based a new name or a new combination on only one of the two names without mentioning the other name as synonymous. Under the generic name *Benzoin* the specific epithet *aestivalis* had to be used to avoid making a tautonym.

The acceptance of *L. Benzoin* as the correct name for the species also makes necessary the following new combination:

Lindera Benzoin (L.) Bl. var. **pubescens** (Palm. & Steyerm.), comb. nov.

Benzoin aestivale var. *pubescens* Palmer & Steyermark in Ann. Mo. Bot. Gard. **22**: 545 (Annot. Cat. Flow. Pl. Missouri) (1935).

According to Palmer & Steyermark this pubescent variety has been confused with *Lindera melissaefolia* (Walt.) Bl. which is a rare plant confined to the coastal plain and Piedmont region of the southeastern states and is easily distinguished by the rounded or subcordate base of the smaller leaves.

Ribes diacanthum Pallas, Reise, **3**: 722 (1776); Fl. Ross. **2**: 36, t. 66 (1788) *"diacantha."*

Pallas considered *Ribes* as of feminine gender, as shown by other specific epithets in his Flora rossica. Lamarck used *Ribes* as neuter, (Encycl. Méth. **3**: 51. 1789), but nevertheless failed to change *"dia-*

cantha" to *diacanthum;* he either overlooked it or did not consider it necessary, since he enumerates the Latin names of species only as synonyms of the French names which take first place. Almost all later authors followed him, apparently without exception, though Ledebour (Fl. Ross. **2**: 196. 1844) made an attempt to save the spelling "*diacantha*" by writing it with a capital letter, and thus made it a noun in apposition, and so did Index Kewensis. There is, however, no reason whatever to suppose that Pallas considered it anything else but an adjective and the name, therefore, should be spelled *Ribes diacanthum;* the adjective *diacanthus* to be treated like *macranthus, polyanthus,* as adjectives of the second declension of the regular type. On account of the almost universal use of the form "*diacantha*" under *Ribes,* I thought it advisable to give the reasons for the change to *Ribes diacanthum.*

Malus Melliana (Hand.-Mazz.), comb. nov.

Pirus Melliana Handel-Mazzetti in Anzeig. Akad. Wiss. Wien, **1923**: 96 (Pl. Sin. Fortsetz. **19**: 2); in Beih. Bot. Centrbl. **48, 2**: 313, fig. 1[2] 1931) "Pyrus."

This species is closely related to *M. formosana* Kawak., but differs in the more remotely and finely serrulate leaves, in the slender pedicel of the fruit about 4 cm. long, and in the smaller fruit 1.5–2 cm. across and narrowed at the apex into a tube about 3 mm. long crowned by the lanceolate calyx-lobes. I have not seen the type of *Pyrus Melliana,* but a specimen collected by R. C. Ching (Wulsin Exp. no. 2327) Aug. 7, 1924, in the region of King Yunn in southern Chekiang (U. S. Nat. Herb.). This specimen agrees very well with Handel-Mazzetti's description and figure except that the fruit of Ching's specimen is produced at the apex into a distinct tube and the sepals are glabrous outside. Probably at least some of the specimens cited by Merrill in Lingnan Agricultural Rev. **4**: 125 (1927) under *P. formosana* belong to this species which may turn out not to be specifically distinct from *Malus formosana,* though distinguishable as a well marked variety.

Prunus Sargentii Rehd. f. **columnaris,** forma nova.

A typo recedit ramis stricte erectis comam angustam formantibus.

This form was raised in 1914 from seed of typical *P. Sargentii* (no. 5777); it appeared in the same batch of seedlings in which × *P. Juddii* E. Anders., the hybrid with *P. yedoensis,* was found. The only tree is growing in the Arnold Arboretum under no. 22585; it is branching from near the base and is at present about 7 m. tall with a crown 2.5 m. in diameter. Specimens in the herbarium collected May 11, 1939.

× **Cytisus versicolor** Dipp. f. **Hillieri** (Hillier), comb. nov.

Cytisus Hillieri Hillier & Sons, Special Offer Trees Shrubs, p. 11 (1933): "A beautiful new chance hybrid with stout arching branches and large yellow flowers stained pale bronze passing to buff-pink. Doubtless the parents are *C. versicolor* and *C. hirsutus hirsutissimus*."

As *Cytisus versicolor* Dipp. is the name for the hybrids between *C. purpureus* Scop. and *C. hirsutus* L., the hybrid between *C. versicolor* and *C. hirsutus* var. *hirsutissimus* (K. Koch) Boiss. falls within the concept of × *C. versicolor* Dipp.

Indigofera incarnata (Willd.) Nakai f. **alba** (Sarg.), comb. nov.

Indigofera decora alba hort. ex Dieck, Hauptkat. Zöschen, 43 (1885).—Sargent in Gard. & For. **7**: 376, fig. 61 (1894).

Indigofera decora var. *alba* Bailey, Cycl. Am. Hort. **2**: 804 (1900); Stand. Cycl. Hort. **3**: 1645, fig. (1915).—Rehder, Man. Cult. Trees Shrubs 500 (1927).

A white-flowered form of *I. incarnata* which typically has pink flowers. The plant growing in this Arboretum was obtained in 1885 from Veitch & Sons who probably received it from Japan through their collector, Charles Maries about 1877. It was collected wild in Japan by E. H. Wilson, no. 6986, June 10, 1914, Hondo, Otakegawa, alt. 800 m., roadsides.

Rhus aromatica Ait. var. **illinoensis** (Greene), comb. nov.

Schmaltzia illinoensis Greene, Leaflets Bot. Observ. **1**: 131 (1905).

Rhus canadensis var. *illinoensis* Fernald in Rhodora, **10**: 52 (1908).

Rhus illinoensis Ashe in Bull. Torr. Bot. Club, **55**: 465 (1928).

This variety differs from the type of *R. aromatica* chiefly in its upright habit and in the leaflets being obtuse or rounded at the apex with few rounded teeth and pubescent above, more densely so beneath. Since *R. canadensis* Marsh. is a later homonym of *R. canadensis* Mill. which is a synonym of *R. glabra* L., Aiton's name has to be taken up for this species and new combinations for this and the following variety become necessary.

Rhus aromatica Ait. var. **serotina** (Greene), comb. nov.

Schmaltzia serotina Greene, Leaflets Bot. Observ. **1**: 131 (1905).

Rhus canadensis var. *serotina* (Greene) Palmer & Steyermark in Ann. Mo. Bot. Gard. **22**: 591 (Ann. Cat. Pl. Missouri) (1935); in Rhodora, **40**: 133 (1938).

Rhus trilobata var. *serotina* (Greene) Barkley in Ann. Mo. Bot. Gard. **24**: 406 (1937).

This variety differs from the type chiefly in its upright habit, in the obtuse or acutish leaflets with few obtuse teeth, in the flowers appearing

with the leaves, and in the larger fruit. It is somewhat intermediate between typical *R. aromatica* and *R. trilobata* Nutt., but differs from the latter in the larger and thinner leaves, the terminal leaflet with few large teeth, not 3-lobed, the lateral ones broad-cuneate or rounded at base and in the larger densely pilose fruit.

Rhus radicans L. var. **Rydbergii** (Small), comb. nov.

Rhus Rydbergii Small in Mem. New York Bot. Gard. **1**: 268 (1900).
Toxicodendron Rydbergii (Small) Greene, Leaflets Bot. Observ. **1**: 117 (1905).
Rhus Toxicodendron Rydbergii Garret, Spring Fl. Wasatch Reg. ed. 2, 69 (1911).

This variety differs from the type in being always an upright shrub, in the sinuate-dentate thickish leaflets, glabrous or pubescent on the veins beneath and in its larger flowers and fruits. Excellent photographs at the Gray Herbarium of the Gronovian types to which Prof. M. L. Fernald drew my attention, show clearly that the northern usually climbing poison-ivy is *R. radicans* L., while the name *R. Toxicodendron* L. applies to the southern upright species with lobed pubescent leaves usually broad-cuneate at base and is the oldest name for *R. quercifolia* (Michx.) Robins. & Fernald; it is to these authors that the combination *R. quercifolia* should be credited, for *R. quercifolia* Steudel was published only as a synonym and is therefore not valid.

Rhus chinensis Mill. var. **Roxburghii** (DC.), comb. nov.

Rhus semialata γ. *Roxburgii* De Candolle, Prodr. **2**: 67 (1825).
Rhus javanica var. *Roxburghii* Rehder & Wilson in Sargent, Pl. Wilson. **2**: 179 (1914), which see for additional synonyms.

As pointed out by Merrill in Trans. Am. Phil. Soc. **24, 1**: 244 (Comm. Lour. Fl. Cochinch.) (1935) the oldest name for the plant known as *Rh. semialata* Murr. and *Rh. javanica* Thunb., non Mill., is *Rh. chinensis* Mill.; therefore, the above new combination becomes necessary for this variety which differs from the type chiefly in the upper part of the leaf-rachis being not or only slightly winged.

Acer Mono Maxim. f. **ambiguum** (Pax), comb. nov.

Acer ambiguum Dippel, Laubholzk. **2**: 457, fig. 218 (1892), non Heer (1878).
Acer pictum var. *ambiguum* Pax in Bot. Jahrb. **16**: 401 (1892).— Schneider, Ill. Handb. Laubholzk. **2**: 225, fig. 150A f. (1907).
Acer Dippelii Schwerin in Gartenfl. **42**: 460 (1893).
Acer pictum var. *Paxii* Schwerin l. c. 458 (1893).— Pax in Pflanzenreich, (Heft 8) IV, **163**: 47 (1902).

Acer pictum var. *Paxii* 4. *Eu-Paxii* Schwerin, l. c. 458 (1893).
Acer Mono var. *Paxii* Honda in Bot. Mag. Tokyo, **45**: 43 (1931).— Hara in Bot. Mag. Tokyo, **50**: 248 (1936).

The material referable to this form of *A. Mono* is all sterile and quite variable in the amount of pubescence; in some specimens the lower leaves are short-pilose on the veins beneath and sparingly so on the surface, while the leaves at the end of the same branch are quite glabrous except axillary beards at the base. I can see no difference between the specimens supposed to represent *A. ambiguum* and *A. pictum* var. *Paxii;* also Schneider (l. c.) enumerates both under *A. pictum* var. *ambiguum* Pax. From the Japanese *A. Mono* var. *velutinum* Nakai it differs in the glabrous branchlets.

The epithet *ambiguum,* though based on *A. ambiguum* Dipp. which is invalidated by the earlier homonym of Heer, must stand as the oldest subdivisional name, since at the time Pax made the transfer, no older name was available and he was justified to take over an epithet though it was illegitimate in its previous combination. The variegated lusus of this form would then have to bear the name **A. Mono** [f. ambiguum] l. **albo-maculatum** (Dipp.), comb. nov. (*A. pictum* a. *albo-maculatum* Dippel, Handb. Laubholzk. **2**: 455 [1892].— *A. pictum* var. *Paxii* 5. *albo-maculatum* Schwerin in Gartenfl. **42**: 458 [1893].— *A pictum* var. *Paxii* f. *albo-maculatum* Pax in Pflanzenreich, (Heft 8) IV. **163**: 47 [1902]). This variation is represented in the Arnold Arboretum herbarium by a sterile branch collected by Schwerin in 1903 and differs in the pilose under side of the leaves from f. *marmoratum* (Nichols.) Rehd. which is quite glabrous; the latter is represented in this herbarium by a specimen collected by Nicholson at Kew.

Ilex crenata f. **Helleri,** forma nova.

Ilex Helleri Verkade's Nurseries [Cat. 1936] p. 13.— Craig, Descr. Price-list, **1937**: 31.
Ilex crenata Helleri, Fleming in F. & F. Nurseries, **1937**: 17; nom. nud.— R. Wyman in Bay State Nurs. Price-list, 1937, p. 21; nom. nud.

A forma typica differt statura compacta humili, foliis congestis ellipticis 8–15 mm. longis obtusiusculis mucronulatis utrinque dentibus 3–4 minutis.

This form resembles in its small leaves *I. crenata* var. *microphylla* Maxim. and in its low dense habit *I. crenata* var. *nummularia* Yatabe but differs from the latter in its elliptic leaves, broad-ovate to orbicular in var. *nummularia* which is of still more depressed and crowded habit. Mr. E. Morell, Peace Dale, R. I., informed me that he has plants eight years old which measure more than ½ m. across and 20 cm. in height.

It was found in 1925 among seedlings of *Ilex crenata* by Mr. Joseph Heller, manager of the Newport Nurseries, Newport, Rhode Island.

Euonymus alata f.**compacta** (Adams), comb. nov.

Euonymus alatus compacta J. W. Adams Nursery Co. Price-list **1928**: 19; **1931**: 31, fig.; Bay State Nurs. [Cat.] **1929**: 24.

Euonymus alatus nana Bay State Nurs. [Cat.] Trees Hardy Pl. [1928], p. 24.

A slow growing compact form forming a subglobose bush with more or less spreading branches with the corky wings absent or only slightly developed.

Koelreuteria paniculata Laxm. var. **apiculata** (Rehd. & Wils.), var. nov.

Koelreuteria apiculata Rehder & Wilson in Sargent, Pl. Wilson. **2**: 191 (1914).— Osborn in Gard. Chron. ser. 3, **78**: 307, fig. 123 (1925).— Bean, Trees Shrubs Brit. Isls. **3**: 200 (1933).

Comparing a large series of specimens, the characters upon which *K. apiculata* was based appear to be variable, and as intermediate forms connect this species with typical *K. paniculata*, it seems better to consider it only a variety of *K. paniculata*, distinguished by the usually bipinnate leaves, the suborbicular to broad-oval sepals with erose or lacerated margin and by the fruit abruptly contracted into a mucro at the rounded or obtuse apex. It seems restricted to central and western China.

Parthenocissus inserta (Kern.) Fritsch f. **macrophylla** (Lauche), comb. nov.

Ampelopsis quinquefolia var. *macrophylla* Lavallée, Arb. Segrez, 34 (1877), nom. nud.

Vitis quinquefolia var. *macrophylla* Lauche, Deutsche Dendr. 470 (1880).

Ampelopsis quinquefolia b. *latifolia* Dippel, Handb. Laubholzk. **2**: 574 (1892).

Vitis quinquefolia var. *major* [Nicholson in] Kew Hand-list Trees Shrubs, **1**: 79 (1894), nom. nud.

Parthenocissus quinquefolia c. *latifolia* Graebner in Gartenfl. **49**: 251 (1900).

Parthenocissus dumetorum var. *macrophylla* Rehder in Sargent, Trees Shrubs, **1**: 188 (1905), errore sub *P. quinquefolia*.

Parthenocissus vitacea Hitchc. var. *macrophylla* Rehder in Mitteil. Deutsch. Dendr. Ges. **14**: 135 (1905); in Bailey, Standard Cycl. Am. Hort. **5**: 2478 (1916).

Psedera vitacea Greene f. *macrophylla* Rehder in Rhodora, **10**: 28 (1908).

Vitis vitacea (Hitchc.) Bean var. *macrophylla* Bean, Trees Shrubs Brit. Isls. **2**: 679 (1914).

This form differs from the type only in the larger leaflets which are up to 20 cm. long and 10–15 cm. wide. Though the epithet *macrophylla* has figured already under six different binomials, new combinations for this and the two following subdivisions become necessary, since an older specific epithet has come to light which had until recently been overlooked, namely "inserta."[1]

Parthenocissus inserta f. **dubia** (Rehd.), comb. nov.

Parthenocissus hirsuta Graebner in Gartenfl. **49**: 251 (1900), synon. excl., non *P. quinquefolia* var. *hirsuta* Planchon (1887).
Parthenocissus vitacea var. *dubia* Rehder in Mitteil. Deutsch. Dendr. Ges. **14**: 135 (1905).
Psedera vitacea var. *dubia* Rehder in Rhodora, **10**: 28 (1908).

This form differs from typical *P. inserta* in the young branchlets and the under side of the leaves being sparsely pubescent. No spontaneous specimens have been found in the herbaria consulted.

Parthenocissus inserta var. **laciniata** (Planch.), comb. nov.

Parthenocissus quinquefolia δ. *laciniata* Planchon in DC. Monog. Phan. **5**: 449 (1887).
Ampelopsis quinquefolia var. *laciniata* A. Gray, fide Meehan ex Planchon, l. c. (1887), pro synon. praeced.
Parthenocissus quinquefolia B. *heptaphylla* sensu Graebner in Gartenfl. **49**: 251 (1900), non *Ampelopsis heptaphylla* Buckl.
Parthenocissus quinquefolia D. *laciniata* Graebner, l. c. (1900).
Parthenocissus quinquefolia E. *serrata* (Spaeth, Cat.) Graebner, l. c. (1900).
Parthenocissus dumetorum var. *laciniata* Rehder in Sargent, Trees & Shrubs, **1**: 188 (1905).
Psedera laciniata Greene, Leafl. Bot. Observ. **1**: 220 (1906).
Psedera vitacea var. *laciniata* Rehder in Rhodora, **10**: 28 (1908).
Vitis vitacea var. *laciniata* Bean, Trees Shrubs Brit. Isl. **2**: 679 (1914).

This variety differs from typical *P. inserta* in the narrower and incisely serrate usually pale yellowish green leaflets. In its typical form it is restricted to the Rocky Mountain region and occurs in Wyoming, Colorado, Utah, Arizona and New Mexico. Several of the synonyms,

[1] **Parthenocissus inserta** (Kerner) Fritsch, Exkursionsfl. Oester. ed. 3, 789 (1922).
Vitis (*Ampelopsis*) *inserta* Kerner, Pflanzenleben, **1**: 658, fig. (1887); Nat. Hist. Pl. (trans. by Oliver) **1**: 699, fig. 166, 1 (1895).
Parthenocissus vitacea Hitchcock, Key Spring Fl. Manhattan, 26 (1894).
Parthenocissus dumetorum (Focke) Rehder in Sargent, Trees & Shrubs, **1**: 187, t. 89 (1905).
Psedera vitacea Greene, Leafl. Bot. Obs. **1**: 220 (1906).
Vitis vitacea Bean, Trees Shrubs Brit. Isls. **2**: 679 (1914).
Parthenocissus inserens = *inserta* (p. 1087) Hayek, Prodr. Fl. Pen. Balcan, **1**: 617, 1087 (1925), sphalmate.

particularly those described by Graebner, are based on cultivated forms and are more or less intermediate between the variety and the typical species.

Here may be mentioned that *P. heptaphylla* (Buckl.) Small (1903) though based on a later homonym, *Ampelopsis heptaphylla* Buckl. (1861), not Roemer & Schultes (1819), must nevertheless be accepted as a valid name, since at the time Small made the transfer, no older specific epithet was available and Small could use an illegitimate specific epithet which is permissible according to article 69 of the Rules with the provision that the name is to be considered a new name and not a transfer; the name, therefore, should be cited as *P. heptaphylla* Small. The combination *P. texana* Rehd. based on *Vitis hederacea* var. *texana* Buckl. ex Durand (1862) was not made until two years later. *Ampelopsis heptaphylla* Roem. & Schult. based on *Vitis heptaphylla* L. f. is not a *Vitis* but probably an *Araliacea*.

Tilia europaea L. f. **tortuosa** (Bean), forma nova.

Tilia platyphyllos var. *tortuosa* Bean in Kew Hand-list Trees Shrubs, ed. 2, 71 (1902) nom. nud.; Trees Shrubs Brit. Isles, **2**: 596 (1914).

This form with twisted and curled branches was first mentioned in Gard. Chron. ser. 3, **4**: 708 (1888) as "Lime with contorted boughs" raised by Mr. G. Swailes, and shown at the December meeting of the Royal Horticultural Society. The Arnold Arboretum received a plant from Kew in 1910, of which specimens collected in 1918 and 1922 are in this herbarium. The specimens show that the plant does not belong to *T. platyphyllos* Scop., because the leaves are perfectly glabrous except axillary tufts of hairs on the green under side, and in this respect agree with *T. europaea* L. (*T. vulgaris* Hayne).

Generally the name *Tilia vulgaris* Hayne has been used for this linden, but Linnaeus considered this linden, as the synonymy clearly shows, the type of his *T. europaea,* enumerating the other plants representing *T. platyphyllos* and *T. cordata,* as varieties under β to ζ. The name *T. vulgaris* Hayne of 1813 could be used only after *T. europaea* L. and *T. officinarum* Crantz (Stirp. Austr. **2**: 61. 1762) had been proposed and accepted as Nomina ambigua. As there does not seem to be any strong reason for making these names Nomina ambigua, the name *T. europaea* should be used for the plant which Linnaeus considered the type. By those authors who split the Linnaean concept into two or more species, the name *T. europaea,* if used at all, has been applied to the species corresponding to *T. vulgaris* Hayne, which is usually considered a spontaneous hybrid between *T. platyphyllos* and *T. cordata*.

Tilia americana L. f. **dentata** (Kirchn.), comb. nov.

Tilia longifolia dentata Hort. ex Kirchner in Petzold & Kirchner, Arb. Muscav. 160 (1864).
Tilia nigra 2b. *incisa* Kuntze, Taschenfl. Leipz. 210 (1867).
Tilia americana megalodonta, V. Engler, Monog. Tilia, 139 (1909).
Tilia glabra f. *dentata* Rehder in Jour. Arnold Arb. **7**: 32 (1926).

This form differs from the typical form chiefly in its coarsely and sharply serrate leaves with very unequal teeth, the larger ones triangular and often with a small tooth near the base.

To the northern linden with glabrous leaves, the name *Tilia americana* L. has been generally applied, and it seems best to retain this name for the species later described as *T. glabra* Vent. though possibly Linnaeus may have included *T. neglecta* Spach in the conception of his species.

Tilia americana L. f. **fastigiata** (Slavin), comb. nov.

Tilia glabra Vent. f. *fastigiata* Slavin in Am. Midl. Naturalist, **12**: 224 (1931).

This form differs from typical *T. americana* in its dense upright branches forming a narrow pyramidal tree. The original tree is described as 8.6 m. tall and 3 m. wide.

× **Actinidia Fairchildii** (*A. arguta* ♀ × *A. chinensis*), nom. nov.

Actinidia arguta × *chinensis* Fairchild in Jour. Hered. **18**: 58, fig. 7 (1927).

Frutex scandens, ramulis initio villosis, medulla lamellosa. Folia ovalia vel late obovata vel suborbicularia, 4.5–8 cm. longa, apice rotundata vel fere truncata et subito brevissime acuminulata vel tantum mucronata, interdum breviter acuminata, basi subcordata vel truncata, setoso-ciliata, supra glabra vel fere glabra, subtus ad costam et venas satis dense, in facie sparsissime villosa, petiolo villoso, 2–7 cm. longo; folia in planta juvenili ovata vel anguste ovata, acuminata, basi cordata vel subcordata. Flores masculi (tantum visi) in cymis paucifloris tomentosis 2 cm. diam., flavido-albi, sepalis tomentosis, antheris flavidis, rudimento ovarii parvo rufo-villoso.

Cult. in Washington, D. C., in hort. C. F. Swingle, coll. May 20, 1939, *C. F. Swingle* (cutting from an original plant raised by D. Fairchild); in Arnold Arb. sub no. 18215 (plant received from Dr. Fairchild in 1924), coll. *A. Rehder*, Sept. 18, 1925.

This hybrid between *Actinidia arguta* (S. & Z.) Miq. and *A. chinensis* Planch. is easily distinguished from the former by the broad, often nearly suborbicular leaves, abruptly acuminulate, densely pubescent on the veins beneath, and sparsely so between the veins, by the tomentose

inflorescence and sepals and by the yellow anthers; from *A. chinensis* it differs in the smaller and narrower leaves, usually rounded and abruptly acuminulate at the apex, only sparingly pubescent between the veins beneath, and in the smaller flowers. The pistillate flowers and the fruit I have not yet seen; they probably will present additional intermediate characters. It was chiefly for the fruit which is large and edible in *A. chinensis* that Dr. Fairchild raised this hybrid in the expectation that it might be considerably hardier than the tender *A. chinensis* and would produce good edible fruit.

I take pleasure in naming this hybrid in honor of its raiser, Dr. David Fairchild who has successfully introduced to this country many useful and ornamental plants which he collected in his travels over a large part of the world, as related in his delightful book "The world was my garden."

Hypericum Dyeri, nom. nov.

Hypericum lysimachioides Wallich, Num. list. no. 4877 (1831), nom. nud.

Hypericum lysimachioides Wallich ex Dyer in Hooker f., Fl. Brit. Ind. **1**: 254 (1874), non Boiss. & Noe (1853).

Hypericum lysimachioides Wall. being a nomen nudum does not invalidate *H. lysimachioides* Boissier & Noe in Boissier, Diagn. II, **1**: 106 (1853) and Boissier should not have changed the name to *H. callianthum* in his Fl. Or. **1**: 800 (1867), because of Wallich's name. The Himalayan *Hypericum lysimachioides,* therefore, has to receive a new name and *H. lysimachioides* Boiss. & Noe remains the valid name for the Kurdistanian species called by Boissier and by all later authors *H. callianthum.*

Helianthemum grandiflorum (Scop.) Lam. var. **obscurum** Pers., comb. nov.

Cistus hirsutus Thuillier, Fl. Paris, 266 (1799), non Lamarck (1790).

Helianthemum obscurum Persoon, Syn. **2**: 779 (1807).

Cistus ovatus Visiani, Fragm. Fl. Ital. **1**: 6, t. 8, fig. 2 (1808).

Helianthemum hirsutum Mérat, Nouv. Fl. Envir. Paris, 204 (1812).

Helianthemum ovatum Duval in DC. Prodr. **1**: 280 (1824).

Helianthemum vulgare β. obscurum Wahlenberg, Fl. Suec. **1**: 332 (1824).

Helianthemum vulgare β. hirsutum Koch, Syn. Fl. Germ. 81 (1837).

Helianthemum Chamaecistus subsp. *barbatum* (Lam.) Gross. var. *α. hirsutum* Grosser in Engler, Pflanzenr. (Heft 14) IV. **193**: 82 (1903), which see for additional literature.

Helianthemum nummularium (L.) var. *obscurum* Schneider, Ill. Handb. Laubholzk. **2**: 351 (1909).— Rehder, Man. Cult. Trees Shrubs, 637 (1927).

This variety differs from the type chiefly in the narrower leaves, generally elliptic-lanceolate to linear-lanceolate, hirsute and pilose on both sides, and in the smaller flowers with the sepals hirsute and villous.

In an earlier account of the genus (Man. Cult. Trees Shrubs, 637. 1927) I had referred *H. grandiflorum* and other related forms to *H. nummularium* (L.) Mill. as varieties following Grosser who under the name *H. Chamaecistus* Mill. had united [in Engler Pflanzenr. (Heft 14) IV. **193:** 82. 1903] into one species the plants with leaves grayish tomentose beneath and those with the leaves pilose to nearly glabrous and green on both surfaces as belonging to one species. It seems more natural, however, to divide this polymorphous group at least into two species, *H. nummularium* (L.) Mill. and *H. grandiflorum* (Scop.) Lam., as Janchen did in 1908 (in Oester. Bot. Zeitschr. **58:** 429–435), though I am not inclined to follow him in his later arrangement of this group (in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21:** 309. 1925) where he distinguishes *H. nummularium* (L.) Mill., *H. tomentosum* (Scop.) Spreng., *H. ovatum* (Viv.) Dun., *H. grandiflorum* (Scop.) Lam. and *H. nitidum* Clem., of which the three last species are united here with *H. grandiflorum* as the oldest name.

Helianthemum grandiflorum f. **cupreum** (Sweet), comb. nov.

Helianthemum hyssopifolium β. *cupreum* Sweet, Cist. 58, t. (1827).
Helianthemum Chamaecistus var. ζ. *cupreum* (Sweet) Grosser in Engler, Pflanzenr. (Heft 14) IV. **193:** 84 (1903).
Helianthemum nummularium var. e. *cupreum* Schneider, Ill. Handb. Laubholzk. **2:** 352 (1909).

This garden form differs in its copper-colored flowers and lustrous leaves sparingly pilose above.

Helianthemum grandiflorum f. **multiplex** (Sweet), comb. nov.

Helianthemum hyssopifolium γ. *multiplex* Sweet, Cist. 72, t. (1828).
Helianthemum nummularium var. *cupreum* f. *cupreoplena* Schneider, Ill. Handb. Laubholzk. **2:** 352 (1909).

A double-flowered form of the preceding.

Helianthemum grandiflorum var. **glabrum** (Koch), comb. nov.

Cistus serpyllifolius Crantz. Stirp. Austr. **2:** 101, t. 6, fig. 3 (1769).
Helianthemum vulgare var. *glabrum* Koch, Syn. Fl. Germ. 81 (1837).
Helianthemum nitidum Clementi in Atti Terz. Rium. Sci. Ital. 517 (1841).— Janchen in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21:** 309 (1925).
Helianthemum vulgare α. *glabrescens* Neilreich, Fl. Niederöstr. 763 (1866).

Helianthemum glabrum Kerner, Sched. Fl. Exsicc. Austr.-hung. **3**: 72 (1883).— Beck, Fl. Niederöstr. **1**: 527 (1890).

Helianthemum Chamaecistus subsp. 1. *barbatum* (Lam.) Gross. var. β. *serpyllifolium* (Crantz) Grosser in Engler, Pflanzenr. (Heft 14) IV. **193**: 82 (1903).

Helianthemum nummularium var. b. *glabrum* Schneider, Ill. Handb. Laubholzk. **2**: 351 (1909).

This variety differs from the type in the leaves being glabrous or pilose only on the margin and midrib beneath.

Aralia elata f. **pyramidalis** (Bean), comb. nov.

Aralia chinensis var. *pyramidalis* Hort. in Kew Hand-list Trees Shrubs ed. 2, 399 (1902) nom. nud.— Bean, Trees Shrubs Brit. Isles, **1**: 197 (1914).

Aralia chinensis fastigiata Skeels & Van Eseltine in U. S. Dept. Agric. Bur. Pl. Indust. Invent. Seeds Pl. Imp. **50**: 64, no. 44378 (1922), nom. nud.

Aralia elata f. *fastigiata* Rehder in Jour. Arnold Arb. **7**: 243 (1926).

When I published the combination *A. elata* f. *fastigiata*, I had overlooked the fact that Bean had already published in 1914 what appears to be the same form as *A. chinensis* var. *pyramidalis* which makes necessary the new combination proposed above.

Rhododendron catawbiense Michx. f. **tomopetalum**, forma nova.

A typo recedit corolla ad trientem inferiorem vel interdum fere ad basim in lobos oblongo-lanceolatos utrinque dentibus duobus instructos raro integros partita.

Kelsey-Highlands Nursery, East Boxford, Mass., shrub collected in North Carolina; specimen in Herb. Arnold Arb., coll. by Harlan P. Kelsey, June 14, 1937.

This interesting form with a deeply dissected corolla is comparable to *R. linearifolium* Sieb. & Zucc. and *R. indicum* f. *laciniatum* Wils. and to *Kalmia latifolia* f. *polypetala* (Nichols.) Rehd. As far as I know, it is the first case of this type of variation in the subgen. *Eurhododendron*. The original plant was found in a collection of plants of *R. catawbiense* made in North Carolina for the Kelsey-Highlands Nursery.

Rhododendron concinnum Hemsl. var. **lepidanthum** (Rehd. & Wils.), comb. nov.

Rhododendron yanthinum Franch. var. *lepidanthum* Rehder & Wilson in Sargent, Pl. Wilson. **1**: 519 (1913).

Rhododendron pseudoyanthinum Balfour f. ex Hutchinson in Spec. Rhodod. 783 (1930).

This variety differs from the type chiefly in its larger and broader

leaves about 6–7.5 cm. long and 2.5–3 cm. wide and in the larger and dark purple corolla more densely scaly and villous outside. *Rhododendron concinnum* is a very variable species and it seems better to treat the plant in question as a variety of this species, than to separate it as a distinct species on unstable characters.

× **Rhododendron pennsylvanicum** (*R. atlanticum* × *nudiflorum*), (Gable) Rehder, comb. nov.

Azalea pennsylvanica Gable (*A. atlantica* × *nudiflora*), Price-list Orn. Trees Shrubs, Spring 1930, p. [10] nom. nud.— Harkness in Nat. Hort. Mag. **11**: 55 (1932), nom. nud.

Inter *Rhododendron atlanticum* (Ashe) Rehd. et *R. nudiflorum* (L.) Torr. medium tenens; a priore recedit foliis ellipticis, pedicellis strigosis eglandulosis, corolla extus dense setoso-pilosa pilis eglandulosis vel sparsissime glanduliferis vestita, sine tomento villoso; a posteriore differt foliis subtus glaucis, costa media sparse strigosa et margine ciliata exceptis omnino glabris; corolla tomento villosulo destituta, lobis extus ad costam mediam manifeste et satis dense setoso-pilosis.

PENNSYLVANIA: moist woods, Stewartstown, *Bijhower & Kobuski 95*, May 27, 1928 (topotype); Arnold Arboretum, cult. under no. 291–35 (plant received from J. B. Gable in 1935).

Daboecia cantabrica (L.) K. Koch f. **pallida** (Bosse), comb. nov.

Menziesia polifolia Juss. var. *pallida* H. Angl. ex Bosse, Vollständ. Handb. Blumengärt. **2**: 521 (1841).

Boretta cantabrica Ktze. var. *rosea* Koopmann in Gartenfl. **47**: 258 (1898).

Daboecia cantabrica K. Koch var. *rosea* Rehder in Bailey, Cycl. Am. Hort. **1**: 443 (1900).

A form with pale rose flowers.

Lyonia lucida (Lam.) K. Koch f. **rubra** (Lodd.), comb. nov.

Andromeda coriacea rubra Loddiges, Bot. Cab. **7**: 672 (1822).

Lyonia marginata D. Don var. *rubra* Lodd. ex Loudon, Arb. Frut. Brit. **2**: 1110, fig. 901 (1838).

Leucothoë coriacea DC. *flore rubro* Koch, Hort. Dendr. 334 (1853).

Pieris nitida Benth. & Hook. var. *rubra* Rehder in Bailey, Cycl. Am. Hort. **3**: 1336 (1901).

Pieris lucida Rehd. var. *rubra* Rehder in Bailey, Stand. Cycl. Hort. **5**: 2622 (1916).

Xolisma lucida Rehd. var. *rubra* Rehder, Man. Cult. Trees Shrubs, 712 (1927).

This form differs in the deep pink or nearly red flowers from the type which has white to pale pink flowers.

Lyonia lucida (Lam.) K. Koch is based on *Andromeda lucida* Lamarck, Encycl. Méth. **1**: 157 (1783). By Schneider (Ill. Handb. Laubholzk. **1**: 530. 1911) this has been considered a later homonym of *A. lucida* Jacquin which he assumed had been published in 1781, because a plate with a very brief description appeared in Jacquin, Icones Plantarum Rariorum, vol. 1, dated 1781–1786. Since in that volume his Collectanea Botanica vol. 1 published in 1786 is cited, while there is neither in his Miscellanea Austriaca, vol. 2 (1781) nor in his Collectanea vol. 1 (1786) any reference to his Icones except in the preface without definite statement whether the work was already published, we may safely assume that the Icones were issued at approximately the same time with his Collectanea vol. 1, if not later, though the plates may have been prepared between 1781 and 1786, as indicated by the fact that plate [79] bears besides the name *Andromeda lucida* the reference "Jacq. Misc. vol. 3"; this is explained by Jacquin in the preface to his Collectanea vol. 1, where he states that vol. 1 of Collectanea was first intended to be published as Miscellanea vol. 3. Most of the other references are to Collectanea vol. 1. The twenty pages of text in vol. 1 of the Icones do not show any sign of having been issued in parts, and moreover, he mentions in the preface issued with the text the Collectanea which were started in 1786, stating that he will continue to give there, as in the Miscellanea, fuller descriptions of the plants figured in the Icones. Therefore the citation of *A. lucida* should read Jacquin, Coll. Bot. **1**: 95 (1786); Icon. Pl. Rar. **1**(1781–86): 8, no. 79, t. (1786), which makes *A. lucida* Jacq. a later homonym of *A. lucida* Lam. and *Lyonia lucida* (Lam.) K. Koch the correct name under *Lyonia*, while the correct name for *A. lucida* Jacq. is *Leucothoë populifolia* (Lam.) Dipp.

Vaccinium angustifolium Ait. var. **laevifolium** House f. **leucocarpum** (Deane), comb. nov.

Vaccinium pennsylvanicum Lam. f. *leucocarpum* Deane in Rhodora, 3: 264 (1901).

As *V. pennsylvanicum* Lam. is a later homonym of *V. pennsylvanicum* Mill., this and the following new combinations become necessary, other combinations having already been made by House (in New York State Mus. Bull. **343–4**: 61. 1923).

Vaccinium angustifolium Ait. var. **nigrum** (Wood), comb. nov.

Vaccinium Pennsylvanicum β. *nigrum* Wood, Class-book Bot. ed. 1861, 483 (1861).

Vaccinium nigrum (Wood) Britton in Mem. Torrey Bot. Club, **5**: 252 (1894); Ill. Fl. Northeast. U. S. **2**: 379, fig. (1897).

This variety differs from the type chiefly in the firmer leaves glaucous beneath and in the black fruit devoid of bloom. Britton elevated it to specific rank, and also Dr. W. H. Camp (in litt.) is inclined to separate it specifically, but it seems too close to *V. angustifolium* var. *laevifolium* to be considered a distinct species.

Syringa Wolfi Schneid. var. **hirsuta** (Schneid.), var. nov.

Syringa villosa var. *hirsuta* Schneider in Rep. Spec. Nov. **9**: 81 (1910).—Lingelsheim in Pflanzenreich, IV. **243**(Heft. *72*): 80 (1920).
Syringa hirsuta (Schneid.) Nakai in Bot. Mag. Tokyo, **32**: 132 (1918).
Syringa formosissima Nakai var. *hirsuta* Nakai, Fl. Sylv. Kor. **10**: 56 (1921).

This variety differs from the type in the pilose branchlets, in the under side of the leaves being more or less densely pubescent over the whole surface and in the densely pilose inflorescence and calyx. It is represented in this herbarium by the following specimens:

North Korea. N. Kankyo prov.: Sha-u-rei, Kanpokdo, *T. Ishidoya,* June 5, 1918; Shagurei to Mozan, common, *E. H. Wilson 8925,* Aug. 16, 1917. N. Heian prov.: *Pukchin & Takkori,* alt. 830–1000 m., *E. H. Wilson 8687,* June 22, 1917.

Northern Manchuria. Kirin prov.: Koalingtzu, *P. H. Dorsett 5989,* June 21, 1926; Goalingtze Mts., *B. W. Skvortzov,* June 16, 1927, Aug. 21, 1927; Schitochetze Sta. of C. E. Ry. on mtn. slopes, June 20, 1927.

Cultivated: Centr. Exper. Farm, Ottawa, Canada, *Isabella Preston,* June 15, 1939 (plant received from F. L. Skinner, Dropmore, Canada).

Syringa subgen. **Eusyringa** K. Koch Ser. **Pinnatifoliae,** ser. nov.

Frutex ramulorum gemma terminali evoluta ramulum foliiferum proferente; paniculis parvis axillaribus; foliis pinnatis foliolis 7–11. Species unica: *S. pinnatifolia* Hemsl.

This series differs from all other groups of the genus in its pinnate leaves and also in the terminal bud of the flowering branchlets developing into a leafy shoot. It is closest to Ser. *Vulgares* and particularly to *S. persica* L. of that series which has leaves partly entire and partly lobed or pinnatifid with 3–7 lobes, but the flowering branches have no terminal bud. In the Ser. *Villosae,* the terminal bud of the flowering branch develops into a large panicle and there are no axillary inflorescences.

Vitex Agnus-castus L. f. **rosea,** forma nova.

A typo recedit floribus roseis et foliis paullo latioribus.

Cultivated in Sanford Arboretum, Knoxville, Tenn.; specimen in herb. A. A., coll. *A. F. Sanford*, July 16, 1938.

There is also a plant of this form growing in this Arboretum under no. 402–37 received from Chenault, Orléans, France, in 1937 as *V. macrophylla rosea;* the plant in the Sanford Arboretum came from the same source.

The form differs from the type in its pink flowers and somewhat broader leaflets approaching *V. Agnus-castus* f. *latifolia* (*V. macrophylla* Hort.). The plant grown in gardens under the name *V. macrophylla* (see Horticulture ser. 2, **5:** 350; **8:** 352; **11:** 290) differs from the type chiefly in the broader leaflets, generally oblong-lanceolate and up to 2.5 cm. wide, and is a hardier and more vigorous plant. It is apparently identical with *V. Agnus-castus* var. *latifolia* (Mill.) Loud., though de L'Obel's figure (Pl. Stirp. Icon. **2:** 139. 1581) cited by Miller shows all the leaves coarsely dentate, but Loiseleur (in Nouv. Duham. **6:** 116. 1813) states that the leaves have only occasionally a few teeth near the apex. I propose to call it **Vitex Agnus-castus** f. **latifolia** (Mill.), comb. nov., since it scarcely merits the rank of varietas.

Lavandula officinalis Chaix f. **albiflora,** nom. nov.

Lavandula Spica alba Sweet, Hort. Brit. 316 (1827) nom. seminud., not *L. Spica alba* Weston.

As *Lavandula Spica* L. has been proposed as a nomen ambiguum by M. L. Green (in Kew Bull. **1932:** 295; **1935:** 75) and will probably be included in the approved list of such names, it seems advisable to transfer the form known as *L. Spica* var. *alba* Sweet to *L. officinalis*. There is, however, an earlier varietal homonym, namely *L. Spica alba* Weston, Bot. Univ. **1:** 146 (1770), which belongs to *L. latifolia* Vill., as Weston's diagnosis under *L. Spica* shows. Weston enumerates also under his *L. angustifolia* a white-flowered variety, but gives no name to it. I have not seen a white-flowered form of *L. latifolia;* the plant cultivated at Kew belongs to *L. officinalis,* as a specimen before me shows, though some of the leaves are up to 7 mm. broad, as they are in a specimen from Hort. Vilmorin at Verrières.

Campsis grandiflora (Thunb.) Loisel. f. **Thunbergii** (Carr.), comb. nov.

Tecoma Thunbergii [Carrière?] in Fl. des Serr. **12:** 181 (1857).

Tecoma Thunbergii Sieb. ex Siebold, Cat. Rais. Jard. Acclim. **1863:** 37, nom. nud.— Carrière in Rev. Hort. **1876:** 440.— Jouin in Jardin, **13:** 104, pl. fig. 1 (1899).

Tecoma radicans var. *Thunbergii* (Sieb.) Lavallé, Arb. Segrez. 176 (1877), nom. nud.— Sieb. ex Mouillefert, Arb. Arbriss. **2:** 937 (1896), excl. descr.

Campsis chinensis Voss f. *Thunbergii* (hort.) Voss, Vilmorin's Blumengaert. **1**: 801 (1894), descr. mendosa.

Tecoma grandiflora Del. var. *Thunbergi* Hort. ex Rehder in Bailey, Cycl. Am. Hort. **4**: 1778 (1902), descr. mendosa.

Campsis chinensis Voss var. *Thunbergii* Voss ex Schneider, Ill. Handb. Laubholzk. **2**: 623 (1911), descr. mendosa.— Rehder in Bailey, Standard Cycl. Hort. **2**: 652 (1914), descr. mendosa.

This form of *Campsis grandiflora* (Thunb.) Loisel. was first described in 1857 in Flore des Serres in an anonymous paper probably by Carrière and based on a plant in the nursery of the Paris Museum, and again by Carrière in 1876; of apparently the same plant, a colored illustration of the flowers was published by Jouin in 1899, without doubt from a plant in the nursery of Simon-Louis; from this nursery I have a specimen before me collected by C. Schneider, stated to have been taken from a plant obtained from Siebold who enumerates *Tecoma Thunbergii* Sieb. in his Catalogue raisonné of 1863. It is described as differing from typical *C. grandiflora* in the brick-red color of the inside of the corolla, in the shorter tube and in the 10-ribbed calyx. By Voss, Mouillefert, Rehder and later authors, the flowers are described as scarlet, probably due to confusion with the hybrid *C. Tagliabuana* (Vis.) Rehd.

The oldest specific epithet for the species is "*grandiflora*" based on Thunberg's *Bignonia grandiflora* of 1784.— *Bignonia chinensis* Lamarck appears in the second part (pp. 369–752) of vol. I of Encyclopédie Méthodique which was published in 1785; the title-page dated 1783 was issued with the first half of the volume.

Weigela sect. **Weigelastrum** (Nakai), comb. nov.

Diervilla sect. *Weigelastrum* Nakai, Trees Shrubs Jap. ed. 2, **1**: 691 (1927), nom. nud.

Weigelastrum Nakai in Jour. Jap. Bot. **12**: 5 (1936).

This section contains only one species, **W. Maximowiczii** (S. Moore), comb. nov. (*Diervilla Middendorffiana* var. *Maximowiczii* S. Moore in Jour. Bot. **16**: 129. 1878.— *D. Maximowiczii* Makino in Jour. Jap. Bot. **1**: 13. 1917.— *Weigelastrum Maximowiczii* Nakai in Jour. Jap. Bot. **12**: 6. 1936.) often placed under sect. CALYPTROSTIGMA from which sect. WEIGELASTRUM chiefly differs in the valves of the fruit not being connate at the apex, in the angular seed with narrow lateral wing and in the connivent, not coherent anthers.

Weigela sect. **Calyptrostigma** (Koehne), comb. nov.

Calyptrostigma Trautvetter & Meyer in Bull. Acad. Sci. St. Pétersb. **13**: 220 (1855); in Middendorff, Reise, **1**, 2: Fl. Ochot. 46, t. 25^a 25^b (1856).— Ruprecht in Bull. Acad. Sci. St. Pétersb. **14**: 93 (1855).— Bailey, Gent. Herb. **2**: 45 (1929).— Schneider in Mitteil. Deutsch. Dendr. Ges. **42**: 14 (1930).— Non Klotzsch (1844).

Wagneria Lemaire in Ill. Hort. **4**: t. 115 (1857); non Klotzsch. (1854).
Diervilla sect. *Calyptrostigma* Koehne, Deutsch. Dendr. 539 (1893).
Macrodiervilla Nakai in Jour. Jap. Bot. **12**: 3 (1936).

This section contains only one species, *W. Middendorffiana* (Carr.) Lem., which by most authors has been referred to *Diervilla*, but recently Bailey (l. c.) has taken up again for this species and *W. Maximowiczii* the generic name *Calyptrostigma* Trautv. & Mey. This name, however, is a later homonym of *Calyptrostigma* Klotzsch, and therefore, Nakai proposed the new generic name *Macrodiervilla* limiting it to the type species. As a sectional name, the name is valid, for Koehne (l. c.) could base a new combination on an illegitimate name, since no earlier subdivisional name under the genus was available.

From sections UTSUGIA A. DC. and CALYSPHYRUM (Bge.) A. DC. this section differs chiefly in the 2-lipped calyx, pilose anthers connected in a ring about the style, calyptrate stigma, in the central column of the fruit not persisting and not projecting and in the linear-oblong seed with wings at the ends. In all characters it agrees with the typical section of *Weigela*, to which the section WEIGELASTRUM forms a connecting link; it seems, therefore, better to consider *W. Middendorffiana* as representing only a well-marked section of *Weigela* instead of a distinct genus.

Weigela floribunda C. A. Mey. f. **grandiflora** (Dipp.), comb. nov.

Diervilla floribunda grandiflora Dippel, Handb. Laubholzk. **1**: 274 (1889).
Diervilla arborescens hort. ex Dippel, l. c. (1889), pro synon.
Diervilla arborea grandiflora hort. ex Dippel, l. c. (1889), pro synon.
Diervilla floribunda f. *grandiflora* Voss, Vilmorin's Blumengärt. **1**: 421 (1894).
Diervilla floribunda var. *grandiflora* Hort. ex Rehder in Bailey, Cycl. Am. Hort. **1**: 484 (1900).— Schneider, Ill. Handb. Laubholzk. **2**: 751 (1911).

A form with rather large, brownish crimson flowers.

Weigela floribunda C. A. Mey. var. **versicolor** (Sieb. & Zucc.), comb. nov.

Diervilla versicolor Siebold & Zuccarini, Fl. Jap. **1**: 74, t. 33 (1837).— Nakai in Jour. Coll. Sci. Tokyo, **42**, *2*: 116 (1921).
Diervilla floribunda var. *versicolor* Rehder in Bailey, Cycl. Am. Hort. **1**: 484 (1900).— Makino in Bot. Mag. Tokyo, **22**: 158 (1908).

A variety differing in the leaves being pilose beneath on the veins and in the flowers changing from greenish white to crimson.

Weigela coraeensis Thunb. f. **alba** (Dipp.), comb. nov.

Diervilla grandiflora alba [hort.] ex Dippel, Handb. Laubholzk. **1**: 271 (1889).

Diervilla coraeensis DC. f. *alba* Voss in Vilmorin's Blumengärt. **1**: 420 (1894).

Diervilla grandiflora Sieb. & Zucc. var. *arborea* Rehder in Bailey, Cycl. Am. Hort. **1**: 483 (1900).

Weigela arborea grandiflora hort. ex Rehder, l. c. (1900), pro synon. praeced.

A form with greenish white flowers changing to pale rose.

Weigela florida A. DC. f. **alba** (Carr.), comb. nov.

Weigela alba Carrière in Rev. Hort. **1861**: 331, t.

Weigela rosea alba T. Moore in Proc. Hort. Soc. Lond. **3**: 280 (1863).

Weigela amabilis alba Jaeger, Ziergeh. 571 (1865).

Diervilla florida f. *alba* Nakai in Jour. Coll. Sci. Tokyo, **42**, *2*: 113 (1921).

Weigela florida DC. var. *alba* Hao in Contrib. Lab. Bot. Nat. Acad. Peiping, **1**: 106 (1932).

Weigela florida var. *glabra* f. *albida* Nakai in Jour. Jap. Bot. **12**: 10 (1936).

Flowers white changing to light pink.

Weigela florida A. DC. f. **candida** (Dipp.), comb. nov.

Diervilla rosea candida Dippel, Handb. Laubholzk. **1**: 269 (1889).

Diervilla florida f. *candida* Voss, Vilmorin's Blumengärt. **1**: 420 (1894), excl. synon.— Nakai in Jour. Coll. Sci. Tokyo, **42**, *2*: 113 (1921).

Weigela florida var. *candida* Rehder in Bailey, Cycl. Am. Hort. **1**: 483 (1900).— Bean, Trees Shrubs Brit. Isles, **1**: 490 (1914).

Weigela florida var. *glabra* f. *leucantha* Nakai in Jour. Jap. Bot. **12**: 10 (1936).

A form with pure white flowers.

Arnold Arboretum,
Harvard University.

EINIGE NEUE CUNONIACEEN AUS NEUGUINEA [1]

JOHANNES MATTFELD

Ceratopetalum tetrapterum, spec. nov.

Arbor gracilis ad 35 m. alta, cortice crasso resinoso; rami novelli inflorescentia terminati, teretes, glabri, griseo-fusci, internodiis sat longis, stipularum cicatricibus transversis amplis. Folia opposita tetrasticha, glabra, trifoliolata, petiolata; petioli 2–4 cm. longi, 2 mm. crassi, apice articulati; foliola petiolulata, lateralia terminali saepe minora et brevius petiolulata vel etiam aequalia, petiolulis 5–20 mm. vel paullum ultra longis, laminae obovato-oblongae, tertia parte superiore latissimae, apice deinde subito acuminatae, basi longius breviusve cuneatim angustatae, in petiolulum decurrentes, margine crenulato-serratae, supra laeves flavo-virentes, subtus costa media prominente, venis venulisque prominulis dense reticulatae, 10–18 cm. longae, 3.5–6 cm. latae. Inflorescentia paniculata terminalis, pluriflora, ca. 18 cm. longa, 12 cm. diam., in statu fructificationis defoliata; pedunculi ulteriores et pedicelli articulati pilis albis densiuscule hirtuli; pedicelli supra articulationem 3–5 mm. longi. Flores (florentes non suppetunt) tetrameri: sepala 4, petala (an desunt an delapsa?); filamenta subulata 1.5 mm. longa 8; carpella 2 connata. Fructus nucamentaceus, sepalis 4 auctis, coriaceis, purpureis, lanceolato-spathulatis 9.5–10 mm. longis, 4 mm. latis, subacutis, pilosulis vel glabrescentibus coronatus, 7–8 mm. longus, monospermus, hypanthio hemisphaerico ca. 5 mm. alto, 6 mm. diametiente, disperse hirtulo demum glabrescente, parte libera conoidea densius hirtula, stylis gracilibus glabris 1 mm. longis demum caducis; pericarpii stratum exterius herbaceum demum siccum, interius coriaceo-osseum; semen unicum loculum saepius plane complens, globosum mucronatum, 5–6 mm. altum, 4 mm. diam., apice interdum irregulariter depressum, hilo lato basilari vel oblique laterali-basilari; testa brunnea firme chartacea; albumen carnosum; embryo flavo-virens; radicula 1 mm. longa; cotyledones transverse trapezoideae, ca. 3 mm. longae, 4.5 mm. latae, basi minutiuscule cordatae, planae vel saepe irregulariter et vario modo et gradu plicatae.

SÜDOST-NEUGUINEA: Fly River, Oroville Camp (30 Meilen über D'Albertis Junction); häufig im Regenwald; schlanker Baum bis 35 m. hoch; Stamm mit Brettwurzeln, Rinde dick, schuppig, mit reichlichem

[1] Botanical Results of the Richard Archbold Expeditions.

aromatischem Harz; Fuchtkelche purpurn (*L. J. Brass* nr. *7405*, August 1936; Typus der Art).

Die Gattung *Ceratopetalum* ist meines Wissens noch nicht aus Neuguinea angegeben worden. Die bisher bekannten 4 Arten sind im westlichen Australien (Neusüdwales und Queensland) beheimatet. Von diesen haben *C. gummiferum* Sm. (gedreite Blätter mit kleinen sitzenden Blättchen), *C. apetalum* Don (Blättchen einzeln, sitzend, grösser) und *C. Virchowii* F. v. M. (Blätter gedreit, Blättchen gestielt, gross, fast ganzrandig) fünfzählige Blüten. Aber *C. succirubrum* C. T. White in Proc. Roy. Soc. Queensland, **47**: 60. 1936 hat mit der hier beschriebenen Art zwei wichtige Merkmale gemeinsam: vierzählige Blüten und gedreite Blätter mit gestielten Blättchen. Verschieden ist aber die Form der Blättchen; sie sind bei *C. succirubrum* kleiner (5–12 cm. lang, 1.5–4 cm. breit), lanzettlich, spitz bis stumpf (nicht zugespitzt und verkehrteiförmig-länglich wie bei *C. Virchowii* und *C. tetrapterum*), und die Behaarung der Blütenstandachsen ist feiner und dichter (etwas filzig). In der Form der Blättchen ähnelt unsere Art mehr der *C. Virchowii* (vgl. die Abbildung in F. M. Bailey, Compr. Catalogue Queensland Plants, 173, fig. 139. 1909), in Blütendiagramm dagegen stimmt sie mit *C. succirubrum* überein. Ein Vergleich der Blütenteile ist leider nicht möglich, da von *C. succirubrum* nur Blüten beschrieben sind, während *C. tetrapterum* nur in Frucht bekannt ist.

Schizomeria katastega, spec. nov.

Arbor coma silvae humilior. Rami ulteriores inflorescentia terminati, graciles, teretes, glabri, internodiis 2–3.5 cm. longis. Folia opposita, simplicia, petiolata, glabra; petioli 1.5–3 cm. longi; laminae pergamenae, late oblongae vel saepius supra medium latiores et deinde obovato-oblongae usque obovato-ellipticae, ca. 10–18 cm. longae, 4–9 cm. latae, apice acutae, basi cuneatim angustatae, in petiolum angustissime decurrentes, glabrae, margine distanter crenato-serratae, supra obscure virides subtus pallidiores, penninerviae, costa media subtus prominente; nervi laterales utrinque saepe ca. 11, inter se (1)–1.5(–2) cm. distantes; venae venulaeque subtus tenuiter prominulae, reticulatae. Inflorescentia terminalis, paniculata, parva, inter folia occulta, vix 10 cm. longa, 8 cm. diam.; rami infimi ex axillis foliorum supremorum, sequentes florendi tempore defoliati, ultimi bracteolis minutis suffulti; pedunculi angulati, glabri sed ultimi et pedicelli pilis paucis parvis albis disperse obsiti; pedicelli articulati, breves. Flores stellati 5–6 mm. diam., hermaphroditi, 5-meri; calycis sub toro connati segmenta ovata, acuta vel obtusiuscula, 2–2.2 mm. longa, 1.8–2 mm. basi lata, trinervia, glabra, persistentia;

petala alba, trifurcata, 1–1.2–1.5 mm. longa, ex medio basim versus unguiculatim angustata, demum caduca; stamina 10; filamenta subulata 1.5–1.8 mm. longa; antherae ovatae, mucronatae, 0.8 mm. longae; discus crassus pulviniformis, apice 1 mm. latus, impresse punctatus, ante stamina episepala profunde partitus, ante stamina epipetala crenatus (gibberes deinde vero 10, anne potius 5 crenati ??), ovarii basim cingens; ovarium globosum, 1–1.5 mm. altum, 1.5 mm. diam., glabrum vel hinc inde pilo albo stricto obsitum, 2-(rarius incomplete 3-) merum, biloculare, ovulis in quoque lovulo 4–5; styli ex basi vel apice tantum recurvi, 1 mm. longi. Drupa ellipsoidea, obtusa, (vivo ex nota collectoris brunnea, ± 2 cm. longa) sicco 15 mm. longa, 10 mm. lata, basi umbilicata, umbilici 3 mm. diametientis margine sepalis persistentibus coronato, monosperma, putaminata; semen ovoideo-cylindricum, 4 mm. longum, 2.2 mm. diam., brunneum; embryo rectus, planus; radicula conoidea 0.8 mm. longa; cotyledones ovato-oblongae, 2 mm. longae, 1.2 mm. latae.

SÜDOST-NEUGUINEA: Mittelerer Fly River, Daviumbu-See, häufiger Baum der unteren Waldetage im trockeneren Regenwalde (*L. J. Brass* nr. *7898;* September 1936 blühend; Typus der Art).— Unterer Fly River (Ostufer), Gaima, häufiger Baum der unteren Waldetage am Rande des Regenwaldes. (*L. J. Brass* nr. *8294;* November 1936, fruchtend).

Schizomeria tegens, spec. nov.

Priori valde affinis, sed diversa foliorum forma et textura, floribus maioribus, druparum forma.— Arbor alta comam silvae formans. Folia coriacea, oblonga vel ovato-oblonga, acuta, glabra, lamina 8–14 cm. longa, 3–5.5 cm. lata. Inflorescentia terminalis paniculata, 15 cm. longa, 8 cm. diam., folia superans, pedunculi ulteriores puberuli. Calycis 3.8–4 mm. alti segmenta ovata, 2.5–2.8 mm. longa; petala ambitu obovata, 2–2.2 mm. longa, 1.2 mm. lata, brevius trifurcata, infra medium unguiculatim contracta; stamina 10, filamenta subulata 2 mm. longa, antherae ovatae mucronatae 0.5 mm. longae; discus crassus, 0.8–1 mm. altus, gibberes 5 bilobi; ovarium semiinferum, saepius 3-(rarius 2-) merum, 1 mm. diam., 1.5 mm. (pars libera tantum 0.5 mm.) altum; styli 1.5 mm. longi, rami liberi 0.5 mm. longi recurvi; ovula in quoque loculo 4–5 (ovarium triloculare cum 15 ovulis). Drupae juveniles obovoideae (10 mm. longae putamine nunc iam nullo).

SÜDOST-NEUGUINEA: Fly River, Oroville Camp; grosser Baum des Regenwaldes, das Dach des Waldes mitbildend, Rinde dick, hellbraun, korkig, rissig, Blüten weiss. (*L. J. Brass* nr. *7429,* im August 1936

blühend; Typus der Art).— Mittelerer Fly River, Daviumbu-See; 20 m. hoher Baum im Regenwalddach; Stamm an der Basis kantig, Rinde hart, dünn, längsrissig (*L. J. Brass* nr. *7497,* im August 1936 mit noch nicht ganz reifen Früchten).

Diese beiden Arten stehen sich sehr nahe, unterscheiden sich aber durch die angegebenen Merkmale der Form und Textur der Blätter, der Grösse der Blüten und der Form der Früchte. *Schizomeria floribunda* Schlechter hat erheblich reichere Blütenstände und vor allen Dingen an der Basis abgerundete (nicht keilig verschmälerte Blätter); *Sch. serrata* Hochr. hat noch grössere und lang verschmälerte Blätter, die übrigen Arten haben kleinere Blätter.

Schizomeria Brassii, spec. nov.

Arbor. Rami juveniles angulati fusci, vetustiores teretes cortice griseo tecti. Folia opposita, petiolata; stipulae connatae interpetiolares, ovato-triangulae, acutae, coriaceae, cito caducae, 4–5 mm. longae; petioli 5–15 mm. longi; laminae coriaceae, glabrae, obovato-oblongae vel obovato-ellipticae, 7–14 cm. longae, 3–7 cm. latae, basi cuneatae in petiolum decurrentes, apice rotundatae et deinde subito brevissime acuminatae, margine crenato-serratae, penninerviae, costa media subtus prominente, nervis lateralibus sat densis, venis venulisque tenuiter prominulis reticulatae. Inflorescentia paniculata, foliis supremis brevior, fructus tantum paucos maturans. Flores (non suppetunt). Drupae globosae, 10–12 mm. longae et diametientes, e carpellis 3 constructae, umbilico basali 5–7 mm. diametiente margine sepalis coriaceis ovato-triangulis acutis coronato.

Südost-Neuguinea (Papua): Jaritari; 3–400 m. ü. M., an Flussufern überhängend in Wäldern des Hügellandes; Baum mit hellgrauer, etwas schuppiger Rinde (*L. J. Brass* nr. *713,* 29 November 1925 fruchtend; Typus der Art).

Diese Art ist durch kugelige Früchte ausgezeichnet. *Schizomeria Pulleana* O. C. Schmidt hat ellipsoidische Früchte; *Sch. floribunda* Schlechter, von der Früchte bisher nicht bekannt sind, hat an der Basis abgerundete Blätter.

Schizomeria Whitei, spec. nov.

Arbor mediocris ad 15 m. alta; rami juveniles angulati, fusci, sparse pilosi mox glabrescentes, vetustiores teretes. Folia pro genere maxima, opposita, petiolata, glabra; stipulae cito caducae; petioli 8–20 mm. longi, crassi; laminae obscure virides, supra paullum nitentes, coriaceae, amplae, late ellipticae, 10–20 cm. longae, 6–10 cm. latae, apice rotundato-

obtusissimae et leniter sinuatae, basi rotundatae vel truncatae vel etiam paullum cordatae, et saepe subito brevissime cuneatim in petiolum contractae, margine crenulis distantibus inconspicuis subintegrae, pennineviae, nervis lateralibus sat distantibus sub angulo fere recto e costa subtus prominente abeuntibus, venis venulisque subtus paullum prominulo-reticulantibus. Inflorescentiae terminalis paniculatae sat ramosae pedunculi pedicellique tomentelli, ulteriores bracteis parvis late ovatis membranaceis suffulti. Flores pentameri, rarius tetrameri; calycis extus pilosi et demum glabrescentis segmenta ex ovato oblonga vel triangula, valvata, crassa, 2.8–3 mm. longa, 1.8–2 mm. lata, subacuta; petala alba, trifurcata, lobis lateralibus longioribus tenuioribus, 2.8–3 mm. longa, basi ca. 0.7 mm., media ca. 1–1.2 mm., apice 1.5–1-8 mm. lata; stamina 10, filamenta applanato-subulata, 2–2.5 mm. longa, antherae ovatae, mucronatae, 1 mm. longae; disci ovarium cingentis gibberes 10 ad basim liberi, 1 mm. longi, 0.5–0.8 mm. crassi; ovarium 0.8–1 mm. altum, pilis longis, rectis, fuscis dense villosum; styli 2 mm. longi, rami 2–3 ad medium connati. Drupae late ovoideae, sicco 1.8–2 cm. altae, 1.5–1.8 mm. supra basim diametientes, umbilico lato, ca. 7 mm. diametiente.

AUSTRALIEN: Queensland, Yungaburra, kleiner Baum in ziemlich dünnem Regenwald (*C. T. White*, im Januar 1918 fruchtend).— Lake Barrine, Atherton Tableland, im Regenwald am Seeufer, sich über das Wasser neigend, 800 m. ü. M., Baum von mittlerer Höhe, häufig (*S. F. Kajewski* nr. *1135*, am 18 Juli 1929 blühend; Typus der Art; Blätter dunkelgrün, Blütenstandsachsen gelbgrün, Petalen weiss).— Range Road, Atherton Tableland, Regenwald, 250 m. ü. M., häufig (*S. F. Kajewski* nr. *1336*, am 7 November blühend und mit unreifen Früchten; mittelhoher Baum bis zu 15 m. hoch, Blütenstandsachsen mit braunen Haaren bekleidet, Sepalen gelbgrün).

Diese Art wurde von C. T. White in Contrib. Arnold Arb. **14**: 40. 1933 als *Schizomeria floribunda* Schlechter angegeben, mit der sie aber nicht vereinigt werden kann, wenn sie mit ihr auch in der Behaarung der Blütenstandachsen etwas Ähnlichkeit hat. Aber *Sch. floribunda* hat kleinere, stärker kerbig-gesägte, spitze Blätter und um die Hälfte kleinere Blüten.

BOTANISCHES MUSEUM,
BERLIN-DAHLEM.

NOTES ON CHINESE BAUHINIA WITH DESCRIPTION OF THREE NEW SPECIES

Luetta Chen

In determining recent Chinese collections sent to the Arnold Arboretum for identification, I have found three new species of *Bauhinia* and four species which represent new records for certain provinces. The material on which this paper is based is deposited in the herbarium of the Arnold Arboretum.

Bauhinia aurea Lévl. Bull. Soc. Bot. France **7**: 368. 1907.— L. Chen,[1] Lingnan Sci. Jour. **18**: . . . 1939.

C. W. Wang 79234 is a new record for Yunnan.

Bauhinia caterviflora L. Chen, Jour. Arnold Arb. **19**: 129. 1938. — L. Chen, Lingnan Sci. Jour. **18**: . . . 1939.

Yu-shih Liu 1351A is a new record for Szechuan.

Bauhinia claviflora, sp. nov.

Frutex, ut videtur, erectus; ramulis teretibus, brunneis, pubescentibus; foliis ovatis, subcoriaceis, 9.5–11 cm. longis, 8.5–10 cm. latis, basi cordatis, obtusis, apice emarginatis, supra glabris, ad nervos subtus pubescentibus, 13-nerviis, nervis utrinque prominentibus; venulis subreticulatis; petiolis puberulis, 2.5–3 cm. longis; inflorescentiis racemosis, pilosis, paucifloris; bracteis binis, caducis; pedicellis crassis, 5.5 cm. longis, pubescentia rubiginosa conferta indutis; calycis tubo 3 cm. longo, pubescente; floribus magnis albis, ad basim rubris; calyce lobato, lobis lanceolatis, 3 cm. longis, 0.3 cm. latis, crassis, tomentosis, longe acuminatis; petalis 5, extus conferte adpresseque sericeo-tomentosis, intus sparse pubescentibus, subcoriaceis, ungue 2 cm. longa, limbo rugoso, 3 cm. longo, 2.2 cm. lato, emarginato; nervis supra prominentibus; staminibus fertilibus 3, filamento crasso, glabro, circa 3.5 cm. longo, 0.15 cm. lato, anthera 2-loba, parcissime pubescente, 1.2 cm. longa; filamentis sterilibus 2, gracilibus, glabris, circa 1.5 cm. longis; ovario stipitato, pube-

[1]For full literature citations, synonymy and distribution see my paper "Bauhinia in China" in Lingnan Sci. Jour. 18: . . . 1939. Editor's note: The Arnold Arboretum has not received to date this publication.

scentia densa rubescente induto; stylo crasso, ca. 2 cm. longo, stigmate lato, ca. 0.4 cm. diametro; legumine ignoto.

YUNNAN: Meng-soong, Dah-meng-lung, Che-li Hsien, *C. W. Wang 78485,* Sept. 1936, in border of woods, alt. 1800 m.

This species is very distinct being strongly characterized by its flowers having five unusually long calyx lobes. The petals are subcoriaceous and silky pubescent on the outside.

Bauhinia corymbosa Roxb. Hort. Beng. 31. 1914, nom. nud.; Fl. Ind. **2:** 329. 1832.— L. Chen, Lingnan Sci. Jour. **18:** . . . 1939.

S. P. Ko 55323 is a new record for Kwangsi.

Bauhinia dioscoreifolia, sp. nov.

Frutex scandens, 3 m. altus; ramis teretibus, breviter atque sparse pubescentibus; foliis ovatis, subchartaceis, 9–13.5 cm. longis, 7–10.5 cm. latis, utrinque glabris, ad apicem breviter obtuseque acutatis, basi truncata vel subcordata, 7-nerviis; nervis conspicuis, utrinque elevatis; venulis utrinque minute reticulatis; petiolis 2.5–5 cm. longis, glabris infima et superiore partibus parce pubescentibus exceptis. Inflorescentiis atque floribus haud visis; legumine ligneo, stipitato, oblongo, glaberrimo, 14–16 cm. longo, 3.5–4 cm. lato, subcorrugato, apice breviter acuminato, basi attenuato; seminibus 5–6.

HAINAN: Kumyun, *S. K. Lau 27552,* Sept. 7, 1936, in dense woods; fruit green.

Bauhinia erythropoda Hay. and *B. dioscoreifolia* L. Chen are somewhat alike in certain aspects but the 9-nerved leaves of the former are cordate and ferruginous pubescent on the nerves on the lower surface. The flowers of *B. dioscoreifolia* are, as yet, unknown, but when these are available, the two species may prove to be not at all closely related.

Bauhinia megacarpa, sp. nov.

Frutex scandens, ramulis tomentulosis; foliis late orbiculatis, subcoriaceis, 14–16 cm. longis, 14–17 cm. latis, brunneis, supra glabris, subtus grosse tomentosis, apice bilobis, lobis ⅓ connatis, abrupte rotundatis, ad basim late cordatis, margine repandulis, 11–13-nerviis, nervis subtus elevatis, venulis utrinque reticulatis; petiolis pubescentibus, demum glabrescentibus, 5–6 cm. longis; inflorescentiis haud visis; legumine ligneo, stipitato, perglabro, nitido, nigro, oblongo, ca. 22 cm. longo, 6 cm. lato apice breviter acuminato, base attenuato; seminibus 8 obovatis compressis, 2 cm. longis, 1.5 cm. latis, margine laevibus, in medio corrugatis.

HAINAN: Nam Shan Leng, Yai-hsien District, *S. K. Lau 5848,* April 7–30, 1935, rare, on dry steep slopes in sandy soil.

This species somewhat resembles *Bauhinia aurea* Lévl. in leaf characters but the legume of *B. megacarpa* is larger, about 22 cm. long and 6 cm. broad, and wholly glabrous.

Bauhinia subrhombicarpa Merr. Lingnan Sci. Jour. **14:** 9. 1935.—L. Chen, Lingnan Sci. Jour. **18:** . . . 1939.

S. K. Lau 28618 is a new record for Kwangsi.

ARNOLD ARBORETUM,
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NOTES ON PHOTINIA

FRANKLIN P. METCALF

IN PREPARING the final copy of *Photinia* for the Flora of Fukien, it was found necessary to describe one new species, two new varieties, and to make a single reduction. In accordance with the usual practice it was thought best to publish these before the publication of the Flora.

I wish to take this opportunity to thank Professor H. H. Humbert, Director of the Paris Natural History Museum, for sending me four merotypes for this study and Dr. E. D. Merrill, Director, and Professor Alfred Rehder, Curator of the Arnold Arboretum for the free access to all library, reference, and herbarium facilities of the Arnold Arboretum. Notes and descriptions follow.

Photinia Beauverdiana Schneid. var. **lohfauensis** Metcalf, var. nov.

A forma typica differt foliis subtus dense tomentosis et inflorescentiis distincte paniculato-corymbosis.

Differs from the species and var. *notabilis* (Schneider) Rehder & Wilson primarily in the sparsely to densely tomentose indumentum of the lower surface of the browner subcoriaceous leaves and the more pronounced paniculate-corymbose inflorescence. The specimens were formerly determined as *P. villosa* and *P. variabilis*.

FUKIEN: no locality, *Chung 6399* (CCC[1]). KWANTUNG: Loh-fau, CCC 1377 (*Levine*), (CCC, type; AA[2]); also same locality, CCC 1381 (*Levine*) (CCC, AA) and 1553 (CCC).

LU 12503 and 12432 (*To & Tsang*) (CCC) from Lung-tau Shan and *Chun 20832* from Lokchang (AA) represent a slightly different form of the same variety but the leaves are larger and more tomentose beneath.

Photinia Cardotii Metcalf, sp. nov.

Photinia subumbellata Rehder & Wilson var. *villosa* Cardot in Notulae Syst. Paris **3**: 379 (1918); in Bull. Mus. Nat. Hist. Paris **26**: 571 (1920).

Frutex; foliis subsessilibus, late ellipticis (4–5 cm. longis et 1.5–2.5 cm. latis), abrupte acutis ad breviter acuminatis, basi cuneatis ad subobtusis, glabris, supra impresso-reticulatis, sparse villosis ad subglabris, venis

[1]CCC: Botanical Survey, Lingnan University (formerly Canton Christian College).
[2]AA: Arnold Arboretum, Harvard University.

subtus 3–5-jugis, margine serrulatis, distincte calloso-incurvo-dentatis. Ramis novellis, petiolis, pedunculis, pedicellis atque calycibus distincte patenter vel adpresse villoso-tomentosis; inflorescentiis subumbellatis, 3–7-floris. Fructibus circiter 6 mm. longis, basi breviter villosis, calycibus villoso-tomentosis.

Shrub; leaves subsessile, broadly elliptical, (4–5 cm. long and 1.5–2.5 cm. wide), abruptly acute or with short acuminate apex, base cuneate to sub-obtuse, glabrous, impressed reticulate above, sparsely villous to subglabrous beneath and with 3–6 pairs of veins, serrulate with distinct callose slightly curved points. Young branches, petioles, peduncles, pedicels, and calyx with distinctly spreading or appressed long villous tomentum. Inflorescence subumbellate, 3–7-flowered. Fruit about 6 mm. long, at base short villous, calyx villous-tomentose.

Distinguished primarily from *Ph. parvifolia* (Pritz.) Schneid. (*Ph. subumbellata* Rehd. & Wils.) by its pubescent pedicels and from *Ph. villosa* var. *sinica* Rehd. & Wils. by its smaller fruit.

FUKIEN: Fu-tschan[3] [possible mistake for Ku-shan], *Popow* in 1883, "Fu-tschau," *Cardot* (l. c.); Ku-shan, *Fukien Christ. Univ. 3668* (CCC); Foochow Hills, *Chung 8393* (CCC) and *8278* (AA). All these specimens are either topotypes of the variety or from localities very close to the original collection by Popow! Additional specimens from Fukien are:— Baek-liang, *Fukien Christ. Univ. 18565;* Yuen Fu, *Dunn 200* = *Hongkong Herb. 2600* (Hongkong, AA); Enghok, *Chung 1370* (Amoy, AA) and *4052* (AA).

CHEKIANG: East Tien-mu, June 19, 1927, *Chung 1597* (AA).

Photinia amphidoxa (Schneider) Rehder & Wilson in Sargent, Pl. Wilson. **1:** 190 (1912); Rehder in Jour. Arnold Arb. **13:** 306 (1932); Chun in Sunyatsenia **2:** 65 (1924).

Stranvaesia amphidoxa Schneider in Bull. Herb. Boiss. ser. 2, **6:** 319 (1906).

Photinia amphidoxa Rehd. & Wils. var. *stylosa* Cardot in Notulae Syst. Paris **3:** 377 (1918), **syn. nov.**

The variety of Cardot was characterized by "Stylis tota longitudine vel fere usque ad apicem coadunatis a forma typica differt." Through the kindness of Professor Humbert of the Paris Museum, I have received merotypes of three numbers cited by Cardot, namely, *Cavalerie 3107, 3291,* and *Cavalerie & Fortunat 2361.* In making a study of *Henry 5565A,* at least a topotype (*Henry 5565* is the type), I find that this

[3]This spelling has been checked for me at Paris by Professor Humbert. He also kindly sent me a leaf merotype for the Arnold Arboretum.

number contains flowers that have free styles and also in some cases have the styles connate almost to the top. This is also true in *Wilson 465* from Hupeh. This difference has been overestimated by Cardot; the degree of connation in some of the Rosaceae is quite variable and cannot be depended upon. No other differences were observable. The pedicels are quite pubescent, as well as the calyx when in flower, but elongate and subglabrous when in fruit.

Handel-Mazzetti (Symb. Sin. 7: 481. 1933) has described a variety *amphileia*, characterized by glabrous pedicels and calyx, and with the fruit in subumbellate clusters. The styles in this variety, iso-syntype, *Handel-Mazzetti 11205* (AA), are also connate nearly to the top or half way, so again the degree of connation of the styles is of little value. This variety is quite a distinct one and may represent a good species. *Steward & Cheo 1011* from Kwangsi distributed as *P. amphidoxa* (Schneider) Rehder & Wilson is quite different and apparently undescribed.

Photinia amphidoxa var. **kwangsiensis** Metcalf, var. nov.

A forma typica differt inflorescentiis subumbellatis, pedicellis dense verrucosis.

This variety differs from the species by the subumbellate inflorescence and the noticeably warty pedicels, and slightly larger fruits. It resembles the var. *amphileia* Hand.-Mazz., in the subumbellate inflorescence, shortness of the pedicels in fruit, but is easily distinguished from it by the abundant warty pedicels and the pronounced carnose serrate margin of the leaves.

KWANGSI: Ling-wang-shan, *Steward & Cheo 1011* (type, AA).

LINGNAN UNIVERSITY,
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POLYGONANTHUS, NOT A GENUS OF THE SAXIFRAGACEAE

LEON CROIZAT

HAVING INTERPRETED *Polygonanthus* as the type of the POLYGONANTHEAE, a new subfamily of the OLACACEAE (Bull. Soc. Bot. France, 86: 5. 1939) I anticipated some criticism and discussion. Controversy is bound to follow when one deals with a family which has ill defined limits and whose genera, in the majority of cases, are poorly known. In addition, the available material of *Polygonanthus* is represented, so far as known, by the type collection of which I have seen but the ♀ flowers. In my short paper cited above I clearly stated my belief that better material, especially mature fruits, may prove this genus to be the representative of a new family. Excluding it from the EUPHORBIACEAE as a matter of course, I suggested its belonging to the OLACACEAE on the basis of the total evidence available at this time.

I was surprised upon learning that at this early date, without apparently having more complete material at hand, Baehni and Dansereau (Bull. Soc. Bot. France, 86: 183. 1939) believe my interpretation of *Polygonanthus* to be fundamentally erroneous. These two authors go on record definitely stating that *Polygonanthus* is a SAXIFRAGACEA related to *Whipplea,* a North American genus.

Although it seems scarcely advisable to discuss the issue before the collection of new and better material, I feel the necessity of keeping the records free of interpretations and comments which a careful reading of my previous paper shows to be at least premature. The reasons why *Polygonanthus* is not a EUPHORBIACEA have been stated in the publication of the new subfamily and it would seem that Baehni and Dansereau have overlooked them. I need not repeat these reasons because the two authors agree with me that *Polygonanthus* is not a EUPHORBIACEA. While I am inclined to question the interpretation of the characters of some of the EUPHORBIACEAE they mention, I do not see the necessity of entering into extended discussion at present.

If we are to believe Baehni and Dansereau, the structure of the ♂ flower of *Polygonanthus* proves that I have misunderstood the carpellary structure of the genus. The two authors point out that the ♂ flower as it is illustrated by Ducke (Arch. Jard. Bot. Rio Jan., 6: pl. VII. 1933)

has a 4-partite pistillode and they argue that, were my notion correct, the pistillode of *Polygonanthus* would be a rudimentary ovary, with a single cell, imperfect septa or partitions and a basal or axil placentation.

I expect to discuss Baehni and Dansereau's understanding of placentations and carpellar structures at the proper time and in the right place. I merely state here that the error of their conclusion is so manifest that it does not require refutation. The two authors evidently confuse the pistillode with the ovary. It is not true, as they affirm (op. cit., 184) that Ducke has figured a 4-partite "ovaire formé de quatre carpelles libres jusqu'à leur base." Ducke has so figured the *pistillode of the ♂ flower*. The assumption that a pistillode has necessarily the same structure as the pistil is one to be dismissed without comment. To give an example: in the EUPHORBIACEAE there are numerous genera in which the pistillode is of several *free* parts or segments (*Securinega, Tetracoccus, Pentabrachium, Mischodon,* etc.), while the ovary, on the contrary, is a *closed* vessel of connate carpels. Nothing, consequently, can be deduced from a study of the former that certainly applies to the placentation and loculation of the latter. As a further instance of the variability of the septa or partitions, even in individuals of the same species, I mention the ovary of *Lychnis*. Much could be said about the attachment and position of the ovules in general. Not to extend this review beyond its intended limits I here call attention only to the CELASTRACEAE, a family in which the ovules are borne at various points of the central axis, from near the basis to the apex of the ovary. Obviously, I have never denied that the OLACACEAE have usually bisexual flowers nor have I overlooked this fact because I have emphasized (op. cit., 6) that, in *Polygonanthus,* apparently fertile stamens are mixed in with staminodes. The fact that in the OLACACEAE the calyx (or the structure that may be interpreted as a calyx) is not adherent to the outer walls of the ovary is precisely the reason why I have tentatively put *Polygonanthus* under a separate subfamily.

It is very much to be doubted that anyone familiar with *Whipplea* in the field and in the herbarium will agree that this genus is related in any way to *Polygonanthus*. Baehni and Dansereau imply that I have forgotten that the OLACACEAE are always estipulate. The number of families in which the leaves are, or are not stipulate is fairly large, witness the list published by Hutchinson (Fam. Flow. Plts., **1**: 80. 1926), a list from which the EUPHORBIACEAE are omitted probably on oversight. It is well known that the value of stipules in taxonomy is not in itself relevant. Speaking of foliar characters, however, I feel free to notice that Baehni and Dansereau themselves disregard the fact that in

the SAXIFRAGACEAE in general and in *Whipplea* most particularly the leaves are opposite, not alternate as they are in *Polygonanthus* and in the OLACACEAE.

The number of carpels, except in well defined cases (the RUBIACEAE, for instance) has slight systematic significance. Consequently, it is not necessary to follow the two authors in a discussion of the families and genera in which the ovary has four carpels in order to prove that such families and genera have, or have not a relationship with *Polygonanthus*. What is well established is that the few-seeded placentation of *Whipplea* is not typic of the SAXIFRAGACEAE, so that a plant having the carpellar structure and the placentation of *Whipplea* is not necessarily a SAXIFRAGACEA. The outer tegument of the ovary of *Hydrangea* and of the SAXIFRAGACEAE in general matches, in its essential structural details, that of the ARALIACEAE and of the CORNACEAE and its resemblance to the outer appendages of the flower of *Polygonanthus*, to judge from the available material, is wholly superficial. The affinities that Baehni and Dansereau believe to exist between *Polygonanthus* and the ROSACEAE and HAMAMELIDACEAE are of the same order as the affinities that connected the ROSACEAE with the FLACOURTIACEAE, TILIACEAE, RUTACEAE, MYRTACEAE and the like. Such relationships are not relevant to a discussion of narrowly defined systematic affinities. I am far from certain that the SAXIFRAGACEAE are a closely knit phyletic unit which the two authors appear to believe. If a 4-locular ovary can be used to bring *Polygonanthus* under the SAXIFRAGACEAE it is to be assumed that *Deutzia* and *Philadelphus* can be transferred to the LYTHRACEAE because they happen to be close to *Lawsonia*.

The fact that Baehni and Dansereau after much evident toil came to the conclusion that *Polygonanthus* is a SAXIFRAGACEA, a family which *Polygonanthus* suggests but most superficially, confirms my belief that *Polygonanthus* at least for the present should be allowed to remain where I have placed it, under the OLACACEAE. It will be time to discuss the systematic position of *Polygonanthus* when new material is available and we have a better knowledge of OLACALES and SANTALALES.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1939

FORTUNATELY for the best interests of the Arboretum it has been possible to accomplish much extra work in the grounds, in the field, in the laboratories, in the herbarium, and in the library through generous unrestricted and restricted gifts from numerous friends and supporters of the institution. This is particularly important at this time with the present strong tendency of invested funds to yield a reduced income, such income being the main source of support to the institution. The unrestricted gifts to the cultural purposes fund amounted to $7100.00 from 308 individuals. Restricted gifts are as follows: The response to an appeal sent out late in 1938 to individuals outside of New England for a hurricane damage rehabilitation fund yielded $2909.70 from 143 individuals. These returns came from all over the United States outside of the hurricane area, as well as from Canada, Great Britain, and the Philippine Islands. Supplementing a grant of $1500.00 to Dr. Raup from the Milton Fund of Harvard University received last year to enable him to undertake a field trip to the remote South Nahanni River region in northwestern Canada, two additional grants were received for the same purpose, $400.00 from the Science Fund of the American Academy of Arts and Sciences in Boston, and $300.00 from the Bache Fund of the National Academy of Sciences in Washington. Final payment amounting to $187.50 was received from the Penrose Fund grant, American Philosophical Society, Philadelphia, in connection with the Bornean *Eugenia* project which was completed early in the year. An anonymous friend of the Arboretum generously provided $1000.00 which enabled us to send Dr. Croizat to Paris for several months during the winter season his major task while there being to segregate important sets of duplicates from historical collections to enrich our herbarium. The same anonymous supporter also provided $125.00 for special photographic equipment needed to make time lapse pictures. Two friends of the institution generously provided $700.00 to be used in support of field work in China and to help provide a scholarship for Miss Luetta Chen, a graduate student in botany in Radcliffe College. The Massachusetts Society for the Promotion of Agriculture granted $500.00 for use in continuation of horticultural-botanical exploration in China. A member of the visiting committee generously continued his annual gift of $500.00

for the care of conifers. And finally $500.00 was received from the National Research Council to support special work in genetics under the direction of Dr. Sax. No actual additions were made to the general endowment fund, other than those annually made in connection with certain restrictions appertaining to two special funds, although notice has been received of a bequest of $25,000.00 from the estate of the late Miss Grace R. Edwards of Boston.

Buildings and grounds.— Normal attention has been given to all buildings, minor repairs having been made as needed. The same statement applies to the grounds, modified, of course, by the enormous amount of rehabilitation work required as a result of the tremendous hurricane damage, September 21, 1938. This was the greatest single catastrophe that has happened to the plantings in the Arboretum since its establishment in 1872. Approximately 1500 trees were destroyed, although fortunately the actual loss in named species and varieties was very small. The very diversified topography of the grounds protected many of the plantings, excessive damage being largely confined to the exposed parts of Peters Hill, Hemlock Hill, Bussey Hill, and the slope immediately back of the Administration building, with a relatively narrow strip extending through the pinetum opposite the low land between Peters Hill and Hemlock Hill. Details of the storm damage are given in the Bulletin of Popular Information. iv. 6: 71–74. October 7, 1938.

As a result of this major catastrophe the entire grounds staff concentrated on the removal of fallen trees and in the general rehabilitation work required through the fall and winter months. By May, the débris was largely cleared, leaving the grounds in a distinctly presentable condition for the great spring displays. While many stumps remain to be removed, some fallen trees still remain in the forested tracts, and much pruning must still be done, this can be taken care of during the coming winter season as a part of the normal program. By judicious planning, and the utilization of funds drawn from the credit balance of the institution, supplemented by gifts from supporters of the Arboretum, it has been possible for us to consummate the major part of the rehabilitation work with our own staff, retaining throughout the winter months those employees who are normally dropped during the usually slack winter season. In preparation for the fall planting in the heavily devastated areas, 625 two to six feet stock of hemlock, white pine and red pine have been acquired for the necessary mass and screen plantings.

The great amount of extra work involved a number of adjustments and required a certain amount of innovation such as increased motorized equipment in the form of a tractor, a low wagon for moving logs and

stumps, a power driven portable cross-cut saw, and other minor equipment. With the tractor a cutter bar attachment was acquired which enabled us to accomplish the necessary grass cutting with our own staff at a considerable financial saving, as formerly it was necessary to arrange with a contractor to have this work done. As a further measure of economy a standard gasoline storage tank and pump was installed near the propagating grounds for the official motorized equipment of the institution.

The work on the detailed mapping of the grounds has been continued. Fifty-six of the section maps have been retraced and the final prints made. The plant locations on the entire series of eighty-two maps have been transferred to the card catalogue. This work has involved hundreds of changes in nomenclature, as mistakes in names have accumulated over a long period of years. To facilitate this work Mr. Palmer continued his task of preparing many thousands of botanical specimens from the named and unnamed shrubs and trees in flower and in fruit, this material being essential to a proper identification of many of the species involved in our serious attempt to modernize and correct the plant labels. New metal labels have been attached to all plants where changes in name have been made, and in the following winter the corresponding display labels will be prepared and attached.

The poison ivy eradication campaign, initiated last year, has been continued with marked results in the reduction of this ornamental, yet at the same time, distinctly noxious plant. In the Walter Street nursery development about a half acre has been planted and 2½ acres have been ploughed, fertilized and sown to a cover crop in preparation for planting development next season.

Through the cordial cooperation and support of the Park Department, in spite of the fact that the Park Department itself was burdened with a tremendous fall and winter task of its own, the entire boundary fence of the Arboretum was renovated, involving rather extensive replacements in those sections badly damaged by falling trees. About 3000 feet of permanent tar-macadam sidewalk was also constructed along both sides of the road leading to Bussey Hill.

Horticulture.— In the fall of 1938 only 38 additional plants were placed in the permanent plantings of the Arboretum, because of the great amount of hurricane damage rehabilitation work that had to be done and which continued through the fall and winter months. In the spring 470 additional plants were placed, making a total of 508 for the year. Many of these represent species and varieties new to the living

collections. During the year 2423 living plants were received at the nursery from various institutions in the United States and from nine foreign countries. At the same time 121 scions and cuttings were received as well as 2225 packages of seeds; this material came from various sources in fourteen different countries. The largest single accession was one shipment of about 2000 packages of seeds from the T. T. Yü Expedition to Yunnan, China, under the auspices of the Fan Memorial Institute of Biology in Peiping, the field work being in part supported by a grant from the Arnold Arboretum.

In the plant and seed distribution field 1173 living plants were sent to numerous correspondents of the Arboretum, supplemented by 691 scions and cuttings, recipients residing in ten different countries. About 12,000 packets of seeds from the Yü Yunnan collections were distributed to about 40 correspondents of the Arboretum all over the world. The bulk of the seeds of herbaceous species was transmitted to the Massachusetts Horticultural Society for distribution to its members and to others who might be interested. Supplementing this special distribution, 555 packets of seeds from Arboretum sources were sent to numerous correspondents in the United States and fifteen foreign countries.

Within the horticultural field approximately fifty illustrated lectures were given to audiences in New England and as far afield as Illinois, Wisconsin, and Virginia. Approximately 2000 letters were written in response to inquiries regarding woody plants. Some work has been continued on the proposed new edition of Standardized Plant Names. The Bulletin of Popular Information list now stands at about 1600, the usual number of issues having been prepared and issued during the year.

Cytogenetic Laboratory.— The investigations in experimental cytology have been devoted largely to a study of the effects of X-rays on chromosome alterations. Such work is of interest in relation to speciation, since it has been shown that speciation often is associated with structural changes in the chromosomes. It has been found that the types and frequencies of chromosome alterations induced by X-rays vary at different stages in the nuclear cycle. The frequency of aberrations increases exponentially with dosage, and is dependent on the time-intensity factor and the temperature at the time of irradiation. An analysis of spontaneous chromosome alterations by Mr. Giles has shown that these changes resemble those induced by X-rays, although the spontaneous changes are not caused by natural radiation. The X-ray work has been supported, in part, by grants from the National Research Council Committee on Radiation during the past two years.

Previous studies have shown that extreme temperature changes result in chromosome doubling in plants. Mr. Giles has shown that temporary periods of drouth may be an even more important factor than temperature changes in the production of polyploidy in nature.

The improvement of ornamental plants by genetic methods has been conducted along several different lines; (1) X-ray treatment to produce mutation and gross chromosome changes, (2) the production of polyploids with colchicine, (3) artificial crossing of species and varieties, and (4) the utilization of natural hybridization.

Seedlings of about 30 species of ornamental plants were subjected to X-ray treatment. Each lot consisted of about 50 plants, arranged so that a variable dosage was given to produce a wide range of effects. The resulting plants, now in the cold-frames, show great differences in growth rate, but other characters show little change so far.

Controlled crosses between species have been continued and several hundred species hybrids are now growing in the nursery. These include apples, cherries, roses, lilacs, azaleas, and magnolias.

Species of apples and cherries are largely self-sterile, and where single specimens of a species are surrounded by other species of the same genus, the seeds produced must result from crosses between species. This natural hybridization provides large numbers of hybrids for the selection of superior types. The more ample nursery space now available has been utilized in growing many of these natural hybrids. There are now about 5000 of these apple seedlings and several hundred cherry seedlings in the nursery. The seedlings from most of the parent trees are extremely variable. The results of this work are being analysed by Mr. Skirm.

The colchicine technique is being used to produce polyploid forms of ornamental trees and shrubs, with good results in certain species. The polyploids should be somewhat sturdier and should flower later than the diploid forms.

The artificial culturing of young embryos often permits the production of hybrids which can not otherwise be obtained. This technique is being used successfully in crosses between species of lilies by Mr. Skirm.

The Bussey institution has been used during the summer months by staff members, students, and occasional visiting investigators working in cytology and genetics. Ten men have been at the Bussey for full or part time work during the past summer.

Wood Anatomy.— During the last year the collection of woods, which was transferred from the Arnold Arboretum, has been incorporated with those previously housed in the Biological Laboratories. The

combined collections have been rearranged, catalogued, and classified by families. In addition, considerable progress has been made in sectioning the woods of selected families, particularly the Juglandaceae, Olacaceae, Santalaceae, Sapindaceae, Rutaceae, Anacardiaceae, Meliaceae, Burseraceae, and Icacinaceae. More than 3500 microscopic slides have been added to the collection during the last twelve months, making a total of more than 20,000 slides of gymnosperms and angiosperms.

Professor Bailey and Mr. Howard are making an extensive investigation of the stem, node, petiole, and floral organs of the Icacinaceae with the object of determining to what extent the salient lines of structural specialization of the stem are correlated with those of the flower and leaf. Dr. Dahl is cooperating in the study of the pollen of this family. Professor Wetmore and Mr. Heimsch have completed and published a detailed study of the comparative anatomy of the woods of the Juglandaceae. Their findings regarding the relationships of the various genera are on the whole in close agreement with those of Manning based upon investigations of the inflorescences and flowers of this family. Mr. Taylor has prepared for publication an investigation of the relationships of the parietalean families based on the anatomy of the secondary xylem. Mr. Heimsch is continuing his survey of the woods of the Geraniales and Sapindales in an endeavor to correlate the results with current taxonomic concepts of the order.

Plant Pathology.— The extension services of the Arboretum's laboratory of plant pathology have been manifold during the year. Inquiries for advice and specimens for diagnosis have been received from as far west as the Pacific coast and as far south as the Carolinas, from Europe and from various parts of Canada. As part of this work a visit of several days was made to the Province of Quebec as guest of its Department of Lands and Forests to advise on a program of investigation in forest pathology. Interest in the program of eradication of the Dutch elm disease has been actively maintained. In that connection, the Arboretum has been represented at Washington twice during the year in appeals to the federal government for maintenance of the undertaking.

Valuable additions have been made to the herbarium, especially of the rust fungi of trees. Some have come as contributions and some from collections made by staff members. Among the latter special mention should be made of materials obtained on a collecting trip to southern Mexico in November and December. The field work there was rendered all the more fruitful because of the generous assistance afforded by the

Mexican forest service. In addition to tree infecting fungi found in Mexico, abundant gatherings were secured of the cones, foliage and wood of a fir from the State of Oaxaca, and from these it has been possible to complete the description of an important timber tree (*Abies Hickeli*). From fir specimens collected the previous year in Guatemala, a new species (*A. guatemalensis* Rehder) has at the same time been published. Record is also made of the discovery in Maine of *Chrysomyxa Empetri* on spruce, a rust on that host not before known for the United States, and heretofore known only, as the result of Arboretum research, from the Province of Quebec. Considerable time has been spent in overhauling the collections of wood-destroying fungi. This has comprised re-labelling, boxing and sorting specimens. So far about 1000 duplicates have been turned over to the Farlow Herbarium and 300 sent to the Bureau of Plant Industry at Washington.

Research activities have covered a number of subjects. Mr. E. V. Seeler has materially advanced his investigation of a wilt disease of *Gleditsia*, not before known until found a few years ago on *G. japonica* in the Arboretum plantings. The causative agent has been established and a preliminary note published. Of especial interest is the fact that Mr. Seeler has found the native *Gleditsia* on Nantucket Island to be infected with the same causal organism, though the manifestations on the native hosts are different and less severe than on the introduced species. The fungus has been reported from rather widely separated regions in America, but without previous recognition of its pathogenicity.

Work is continuing on a serious bark disease of the flowering dogwood. It was first noted on Long Island, but a case was found last July at Amherst, Massachusetts.

Considerable progress has been made in the studies of the rust fungi of the conifers and of the Pomaceae. Most important of the publications issued are monographic treatments of the biology, taxonomy and geographical distribution of the genus *Uredinopsis*. These rusts are all heteroecious, having as their alternate hosts firs (*Abies*) on the one hand and various ferns of the Polypodiaceae and Osmundaceae on the other. Representatives occur in all of the continents except Australia. Several new species are described and accounts given of various new life history researches. A detailed study of the genus reveals many pronounced morphological diversities exhibited by the spores. According to the species they are smooth, uniformly warted or spinose, cogged along two opposite longitudinal lines or appendaged. Perhaps the most remarkable is a newly described type with capsulated spores found in two species, one from Guatemala and the other from Eastern Asia. It was incidental

to the tracing of these rusts to the southernmost limits of *Abies* that knowledge of the two firs referred to above was obtained.

The Herbarium.— The number of mounted specimens actually distributed into the herbarium was unusually small, only 5218 sheets, bringing the total to 484,942 specimens. During the year, however, in excess of 38,000 additional sheets were mounted, mostly from collections under study and hence not yet ready for herbarium distribution. The year has been characterized by an unusually large number of important accessions, approximating 111,500 specimens, not including duplicates. The numerous collections received vastly exceed in number of specimens any single year's accessions in the entire history of the institution. Nearly half of these, about 53,000 specimens are from Asia, about 38,600 being from China alone. Important Chinese accessions include the Lingnan University material from Kwangsi, Kwangtung, and Hainan, the Yunnan collections of T. T. Yü and important Hopei collections from the Fan Memorial Institute of Biology, and Szechuan material from Nanking University, Chengtu. Approximately 3000 Indian plants were received from the Royal Botanic Garden, Calcutta, extensive additional collections of Burma plants from Dr. Dickason of Judson College, Rangoon, and important exchanges from the Botanic Garden, Singapore, and the Bureau of Science, Manila. The outstandingly important collection from the Old World tropics is the enormous L. J. Brass collection from the previously unexplored Wilhelmina Mountains, Netherlands New Guinea, assembled in connection with the third Richard Archbold expedition to New Guinea. This collection contains approximately 5500 numbers perhaps averaging 5 duplicates to a number. From Asiatic Russia about 2000 specimens were received from the Principal Botanic Garden at Leningrad. Approximately 14,000 specimens were received from various parts of North and South America including 700 Skutch plants from Costa Rica, 800 Gentle plants from Honduras, 1800 Mexican plants from the collections of Hinton and Matuda, and about 4500 specimens from the Thompson collections in British Columbia. Especially important exchanges include 11,480 miscellaneous duplicates from all parts of the world received from the Botanic Garden, Geneva, Switzerland, about 18,000 specimens from the Paris Museum of Natural History, largely from China and Indo-China but including very important material from other parts of the world, the special Koehne Lythraceae herbarium from the Berlin Botanic Garden, and about 750 South American specimens, largely from the historical Poeppig collection from the Vienna Museum of Natural History.

In continuation of exchanges 50,017 duplicates were distributed to various American and foreign institutions; 14,470 specimens of herbaceous plants were transmitted to the Gray Herbarium, 1931 orchid specimens to the Ames Orchid Herbarium at the Botanical Museum, and 1205 specimens of cellular cryptogams to the Farlow Herbarium.

Forty-five loans were sent to 19 different institutions in America, Europe and Asia, approximating 4000 mounted sheets for study, while 52 loans with about 8511 mounted sheets were received from 23 institutions in the United States, Canada, Netherlands, France, Germany, England, Scotland and Sweden for the use of our own staff members.

The collection of negatives representing types and critical specimens has been increased by 228, the total now being 3951 negatives. The current card catalogue of references to names and descriptions of new species and of illustrations was increased by 3790 cards, now standing at 121,177 entries.

Work on segregating species in large genera in colored genus covers for specific geographic areas has been continued, and in addition, species covers are being inserted for convenience in consulting the material. It is estimated that between 20,000 and 25,000 additional typed or clipped entries have been inserted into the herbarium, these covering not only original descriptions but also redescriptions, critical notes, etc.; numerous illustrations are also included. Many additional data of this type are prepared and are now being arranged for distribution.

Perhaps the most important item in reference to the efficient prosecution of herbarium work has been the clipping and alphabetizing, in loose leaf ledger form, of all the entries in Index Kewensis and its nine supplements. The work has been done in such a manner that future additions may be made for many years without seriously breaking sequences, while the entries for all large and medium sized genera are left "hanging" so that by the insertion of new sheets, as necessary, additions can be made indefinitely. The data are arranged in six large binders, thus bringing together in a single sequence all the entries under each genus. The usefulness of this is obvious when it is realized that in extreme cases in examining Index Kewensis, one must, or should, search in fifteen different places to be sure that one is not overlooking a name and reference.

Work by staff members has continued on the groups, as indicated, in the last report. Professor Rehder has completed his manuscript for a thorough revision of his Manual of Cultivated Trees and Shrubs which is to be published in 1940, and has given much attention to nomenclatural problems. Another activity on his part has been the correcting of the

identifications on the great collection of Arnold Arboretum cultivated plants assembled by Mr. Palmer during the past two years, this being a part of our program to modernize and correct labels on all species and varieties now cultivated as far as this is possible. Dr. Johnston spent two months in field work in Coahuila, Zacatecas, San Luis Potosi, and Chihuahua, Mexico, in association with Dr. Forrest Shreve of the Desert Laboratory of the Carnegie Institution. The objective was a cooperative ecological and botanical survey of the desert areas of northern Mexico. Over 1000 numbers, with about 3000 specimens of herbarium material were prepared, the collection having been studied during the past winter. In addition to this work he has studied and reported on about 1200 numbers of plants from the Argentine and Chilean collections of Barros, Parodi, and Cabrera, and has reported on about 1250 specimens of Boraginaceae sent to him by various correspondents for identification. As a result of his activities in the last two fields 2422 mounted specimens were added to the reference collections at the Gray Herbarium. He has also supervised the work of Carlos Muñoz, Guggenheim Fellow from Chile, working at the Gray Herbarium. Dr. Kobuski, in addition to his general herbarium and editorial work has continued his studies on *Eurya* and *Jasminum*. Dr. Allen is continuing her general studies on Old World Lauraceae. In association with Miss Freeman, I have completed a critical revision of the Old World species of *Microtropis,* while with Dr. Perry general work on the L. J. Brass collections from the Fly River Region, New Guinea (Second Richard Archbold Expedition) has been initiated. Considerable work has also been accomplished on various Chinese, Indo-Chinese, and Burmese collections submitted to me for identification and report. Much attention has also been given to the problem of completing a supplement to the Bibliography of Polynesian Botany, about 350 additional entries having been completed and prepared for printing. The plan is to carry this through to the end of December, 1939, and then publish the results. Dr. Raup was in residence during the past summer at the Harvard Forest, Petersham, engaged in an intensive study of land ownership, and use of all parcels now forming the Harvard Forest from the period of first settlement until the present time. In the latter part of the year he completed his plans for his eighth trip to northern Canada, his objective this time being the remote South Nahanni River region in the extreme northwest. This trip was made possible by a grant from the Milton Fund of Harvard University, supplemented by smaller grants from the American Academy of Arts and Sciences, the National Academy of Sciences, and the Arnold Arboretum. Dr. Jones completed and published his revision

of the North American species of *Sorbus*, completed and published his flora of Mount Rainier, has practically completed his revision of the genus *Symphoricarpus* and has accomplished much work on the manuscript of his flora of the Pacific Northwest. Dr. Croizat was able to spend several months in Paris during the winter, through the generosity of an anonymous friend of the Arboretum. Here he studied numerous euphorbiaceous types, and through arrangements made by Dr. H. Humbert, was enabled to segregate from the vast store of duplicate specimens there, approximately 18,000 specimens which were received at the Arboretum before the end of the year. He has continued his work on the classification of the Euphorbiaceae, and in association with Mr. Hara, a Japanese botanist spending the year at the Gray Herbarium, has initiated a study of the Formosan species based, in part, on actual types borrowed from Japanese institutions. Miss Luetta Chen, part time assistant, has continued work on the Chinese species of *Bauhinia*, and has undertaken a revision of the eastern Asiatic species of *Ormosia*. Mr. Russell Seibert, another part time assistant, has worked intensively on the Central American species of Bignoniaceae. Prof. F. P. Metcalf of Lingnan University has reported at the Arboretum, planning to spend much of the coming year here working on the Chinese flora.

In further development of cooperative botanical-horticultural explorations additional grants have been made to the Fan Memorial Institute of Biology, Peiping, for field work in Yunnan, to Nanking University, Chengtu, for work in Szechuan, to J. W. Thompson, Seattle, for field work in British Columbia, to Robert Virot, Noumea, for work in New Caledonia, E. Fénix, for work in the Philippines, to Judson College, Rangoon, Burma, to support Dr. Dickason's field work, and to the University of Michigan in partial support of Dr. Eyma's field work in Netherlands New Guinea. The grants to Chinese institutions were made possible through a special gift received from the Massachusetts Society for the Promotion of Agriculture for horticultural-botanical work in China.

The Library.— At the end of the fiscal year the library comprised 44,123 bound, and several hundred unbound volumes, 12,469 pamphlets, 18,444 photographs, 3000 slides, and several thousand nursery catalogues. Additions during the year include 566 bound volumes, 166 pamphlets, and 266 photographs, among which were 32 from L. J. Brass, taken on the Archbold expedition to New Guinea, 70 of hurricane damage, 14 from A. B. Morse Co., Michigan, and 12 of prominent scientists from A. E. Marr. A total of 10,858 cards were distributed in the various

indices and 1791 slips were filed in preparation for supplements to the printed Author and Subject catalogues of the library, making the number now available for publication 28,000. The number of books bound was 223, while 136 were put into pamphlet binders and a large number tied in manila covers. Seven new periodicals were acquired among them being a nearly complete set of the Journal of the Straits Branch of the Royal Asiatic Society and the rare Journal des roses, 1877–1914. A number of important atlases have been acquired including the first volume of the Russian "Bolshoi Atlas Mira." More than 200 volumes have gone out as inter-library and special loans; photostats have been made and references checked and copied. The demand for photographs continues, 379 having been sold during the year. Two copies of the Catalogue of the Library of the Arnold Arboretum, Vol. 1–3, and 6964 slips for copying were sent to the University Library, in order that the entries might appear in its union catalogue. Visitors from many states and eleven foreign countries registered in the library during the year.

The Atkins Institution of the Arnold Arboretum, Soledad, Cienfuegos, Cuba.— From the garden standpoint the most important item in the past year's accomplishments has been the consummation of an agreement with the Soledad Sugar Company as to the ultimate area of the garden and the final fixing of the boundary lines. An actual survey was made in February, 1939, the area definitely assigned to the garden being 221.63 acres. It is now possible to make plans for the permanent location of study groups particularly with view to the placing of those species needing relatively little moisture on the outlying lands thereby avoiding the necessity for the extension of the present water lines.

The construction of a new house with dormitory facilities for eight individuals and two private rooms that will accommodate four more will make a much greater use of the garden possible. Casa Catalina, a permanent concrete building constructed in part at the expense of Mrs. Edwin F. Atkins and in part through an anonymous gift, is located on the brow of the hill above Harvard House, overlooking the garden and the surrounding valley to the mountains beyond. Construction was completed in January, 1939. The provision of these facilities for housing additional investigators will enable us to invite representatives of other institutions in the United States and elsewhere to take advantage of the research facilities available at the Atkins Institution and thus extend its influence and productivity.

During the early spring most of the older hurricane damaged trees in the old garden were removed. Here are being transplanted numerous

palms from other parts of the garden with view to developing this section into a special palm garden. Additional plantings have been made in the extensive new succulent garden, and in the *seburuco* section, reserved for native vegetation. In the latter much thinning of the various weed trees has been accomplished, as well as the removal of many of the lianas and coarse grasses that seriously interfered with the development of the arborescent vegetation. This interesting section has been made much more accessible by the improvement of roads and the opening of trails. We are greatly indebted to several Cuban botanists for many new plants. Brother Léon and Señor Carrabia, collaborators on the staff of the institution, have generously supplied many native Cuban ferns for these plantings.

As a result of the improved communications, as noted in a previous report, the number of visitors increases annually. Now that the garden can be reached over really good automobile roads, located as it is just off the main Havana-Cienfuegos highway, several changes have been made in the driveways within the grounds to facilitate automobile traffic, and attention will soon have to be given to bridge and culvert construction in the near future.

As a part of its service to Cuban horticulture and botany, 442 living plants, 113 packages of cuttings, and 456 packages of seeds were distributed during the year, while 67 packages of cuttings and 556 packages of seeds were received.

During the year Professors Bailey and Needham of Cornell University have made use of the facilities available at the Atkins Institution in connection with their research problems. Brother Marie Victorin of the University of Montreal visited the Garden twice in company with Brother León, one of our collaborators, and a number of Cuban officials took advantage of the facilities offered. The usual number of Harvard University graduate students spent the summer at the Harvard House laboratory. A complete report on the scientific activities of the Institution since Harvard House was constructed, and a general résumé of Garden history since its inception thirty-five years ago, is in process of preparation. One of the objectives in the preparation of this report is to call attention to the now amplified facilities available at the Atkins Institution for those interested in biological research in the tropics.

Publications.— In addition to issuing the usual numbers of the JOURNAL and of the BULLETIN OF POPULAR INFORMATION a number of technical, semi-technical, and popular papers were published by staff members in standard serials issued elsewhere, as indicated in the

appended bibliography of publications by staff members. One number of the CONTRIBUTIONS was issued, an important paper by Dr. Faull on the genus *Uredinopsis*. A very useful manual on the technique of preparing and handling of herbarium specimens, prepared by Dr. Johnston, was also issued during the year, it being intended primarily for the use of correspondents of the Arboretum engaged in field work.

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E. D. MERRILL, Director

Staff of the Arnold Arboretum, 1938–39

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John George Jack, Assistant Professor of Dendrology, Emeritus.

Alfred Rehder, A.M., Associate Professor of Dendrology and Curator of the Herbarium.

Joseph Horace Faull, Ph.D., Professor of Forest Pathology.

Irving Widmer Bailey, S.D., Professor of Plant Anatomy.

Karl Sax, Ph.D., Professor of Cytology.

Ivan Murray Johnston, Ph.D., Associate Professor of Botany.

Clarence Emmeren Kobuski, Ph.D., Assistant Curator of the Herbarium.

Donald Wyman, Ph.D., Horticulturist.

Ernest Jesse Palmer, Collector and Research Assistant.

Caroline Kathryn Allen, Ph.D., Assistant in the Herbarium.

Hugh M. Raup, Ph.D., Assistant Professor of Plant Ecology.

Lily M. Perry, Ph.D., Technical Assistant.

Leon Croizat, J.D., Technical Assistant.

Ethelyn Maria Tucker, Librarian.

Susan Delano McKelvey, Research Assistant.

Constance Mansfield Gilman, Business Secretary.

Louis Victor Schmitt, Superintendent.

William Henry Judd, Propagator.

CORRECTIONS

Page 94, line 14, for comb. nov. read Handel-Mazzetti, Symb. Sin. **7**: 459 (1933).

" 187, line 3, for *pendulifera* Zipp. read *penduliflora* Zipp. ex Miquel.[1]

" 204, line 15, for *Wendlendiana* read *Wendlandiana*.

[1] *Licuala penduliflora* Zipp. ex Miquel, Fl. Nederl. Ind. **3**: 55 (1855).—Ed.

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